THE Business History REVIEW

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The BUSINESS HISTORY REVIEW

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The Fleece and the Loom: Wool Growers and Wool Manufacturers during the Civil War Decade

Almost by definition American wool manufacturers and wool growers stood on opposite sides of any question relating to tariffs. Yet the Wool and Woolens Act of 1867 served the interests of both groups and was pushed through Congress and across the desk of a reluctant President by their determined joint efforts. The circumstances surrounding this historic episode of commercial alliance are revealing as to the forces that have shaped American tariff policy and provide an insight into incipient efforts on the part of the businessman to control his environment by co-operative as well as by competitive means.

With the growth of manufacturing interests in the United States, the question of tariffs has in many instances brought a cleavage between the producers of raw materials and the fabricators. But in the wool industry an alliance between the two groups produced spectacular benefits to both.

> The only context which can give success to our efforts lies, not between ourselves as wool-growers and wool manufacturers, but between us and the wool growers and wool manufacturers of other nations. . . . We are one in interest and should be allied in purpose.

Thus spoke Erastus Bigelow, first president of the National Association of Wool Manufacturers, at a convention of growers and manufacturers in 1865.[1] This is the story of the forging of the alliance he sought and of its first fruits.

On the eve of the Civil War some 24 million sheep nibbled the grasses of the United States, yielding perhaps 80 million pounds of

[1] *Report of the Proceedings of the Convention of Delegates from the National Association of Wool Manufacturers, and from the Several Organizations of the Wool Growers of the United States at Syracuse, New York, Dec. 13, 1865* (Boston, 1866), 11. Hereafter cited as *Report of the Syracuse Convention.*

wool.[2] Most of them were descendants of the Spanish merinos * which, introduced into this country in the early years of the century, inaugurated the first American merino "craze" and were the foundation of the modern wool growing industry. Much of the wool was of a medium quality well suited to the needs of the domestic manufacture of clothing materials. Some coarser wools for blankets and extra fine wools for broadcloths were also produced. The grades lacking were chiefly coarse carpet wools, which could be imported cheaply, and long combing wools for which the new worsted manufacture was creating a demand.

Although no state lacked its flocks, six states accounted for about half the total number of sheep in the country. Ohio led, with New York, Pennsylvania, Michigan, California, and Virginia following in the order named. Vermont with perhaps three-quarters of a million sheep was more important than the figures suggest, since her blooded stock had achieved a wide reputation and was the foundation of many a flock to the westward.

The wool was produced under varying conditions. In Texas and California flocks were large, costs low, and the climate mild. In the older eastern and middle states, whose growers, it was said, did not "average 150 acres of land and 150 sheep each," [3] the farmer was at an extra expense for fodder and shelter through the long hard winters.

The industry was by no means static, and only in the newer states was the curve of production upward. While the number of sheep in Massachusetts fell off by nearly a third between 1850 and 1860, California for the same period showed an increase of more than sixtyfold, Texas of more than sevenfold. In Texas, George Wilkins Kendall was making money at wool growing faster, he thought, than any man had ever made it before.[4] Easterners, faced with rising land values, hard winters, and an increasing number of dogs, had no such rosy outlook.

[2] This includes about a million and a half estimated but not enumerated in 1860. See *Twelfth Census of the United States, 1900, Agriculture* (Washington, 1902), I, ccxiii–ccxiv. The figure for the wool clip is that of Chester W. Wright, presented in *Wool Growing and the Tariff; A Study in the Economic History of the United States* (Boston, 1910), 176. Wright's estimate is midway between the census figure and an estimate of about 100,000,000 pounds made by George William Bond, a nineteenth-century Boston wool dealer.

[3] *Moore's Rural New Yorker*, 21 May 1864.

[4] Kendall to Henry S. Randall, 23 June 1867, New-York Historical Society. His remark refers to the years 1856 to 1861. In 1867 his flocks were roaming over about 15,000 acres of land, only one-third of which belonged to him.

* A fine-wooled white sheep of hardy breed.

The American woolen manufacturer supplied the market for American wool. The woolen industry in 1860 was seventh among the nation's manufactures measured by net value of product.[5] Although woolen manufacture was widely dispersed, the great bulk of it was in New England and the middle states. These sections accounted for about 90 per cent of the total capital investment of over $40 million. New England alone had nearly 60 per cent of the total, and half of the New England investment was in Massachusetts.

But domestic wool did not satisfy the whole need of the American manufacturer. In the year ending 30 June 1860, more than 26 million pounds of raw wool were imported.[6] Some of it – long combing and coarse carpet wools – did not seriously compete with the American clip. Other types, particularly the mestiza from the pampas of the Argentine, were similar to the wools produced in the United States.

The Civil War profoundly affected both the growing and manufacture of wool. The shortage of cotton and the military demand for woolens brought unprecedented prosperity to the manufacturer. Higher tariffs, a War Department order against foreign purchasing for military needs where the domestic woolen manufacturer could supply the goods, and the protection afforded by the premium on gold reduced the flow of fabricated wool from abroad. As profits soared, large dividends were declared, old debts paid, new mills built. The number of sets of machinery in use in the United States increased by about 50 per cent between 1860 and 1865.[7] The growers in turn experienced a sharp upswing in the demand for wool. Prices in inflated currency seemed very attractive. The result was the reversal of the downward trend of the wool growing industry in the older states. Ohio more than doubled its number of sheep between 1860 and 1867.[8] New York between 1860 and 1865 made a gain of perhaps a million sheep.[9] Vermont found new prosperity as a new merino "craze" developed. The Middle West

[5] Computed from the *Eighth Census of the United States, 1860, Manufactures* (Washington, 1865).

[6] Chief of the Bureau of Statistics, *Special Report on Wool and the Manufactures of Wool* (Washington, 1887), 14.

[7] John L. Hayes, *The Fleece and the Loom, An Address before the National Association of Wool Manufacturers at the First Annual Meeting in Philadelphia, Sept. 6, 1865* (Boston, 1866), 46.

[8] United States Department of Agriculture, *Special Report on the History and Present Condition of the Sheep Industry of the United States* (Washington, 1892), 574.

[9] *Census of the State of New York for 1865* (Albany, 1867), 403, reports that 3,781,995 sheep were shorn in that state in 1865.

began to envision itself as the great wool producing region of the future, Texas and the vast spaces of the Far West apparently being for the moment forgotten. For the domestic grower the one cloud on the horizon was the wartime increase in the importation of wool. In the year ending 30 June 1864, more than 90 million pounds came to this country, much of it from the Argentine.[10]

The interdependence of American growers and manufacturers did not promote friendly attitudes and relationships. Instead there was suspicion, antagonism, and recrimination between the two groups.

Sale of the wool produced much friction. Manufacturers complained of the slovenly, careless, and dishonest practices of farmers in doing up their fleeces.[11] Poorly washed wool was offered as washed wool; unwashed wool from dead sheep was packed inside washed fleeces. Sweepings from the shearing shed and the dirtiest and least desirable parts of the fleece were bound up with the better wool. Fleeces were tied with excessive amounts of twine. Growers complained about the arbitrary deduction of one-third of the weight from wool that had not been washed. And they charged the manufacturers with deliberate efforts to depress the price of wool.[12]

"Why don't you *blow up* the farmers about the ridiculous manner in which they put up their wool?" a wool buyer demanded of the editor of *Moore's Rural New Yorker*, adding that he did not believe that there was an honest farmer in the state.[13] A letter writer in the same paper had a different view. He held that "the manufacturer is just wicked and mean enough to connive to cheat the farmer out of his just due." [14]

But it was over the tariff that the two interests clashed most resoundingly. Under the "manufacturers' bill" of 1857 all wool valued at 20 cents or less per pound was admitted free. Gone was the "equality" of the Walker Tariff Act of 1846, under which both wool and most of its products paid a duty of 30 per cent. The Morrill Act of 1861 gave the wool grower a slightly better deal – but not much. Under this act most imported wool paid only 5 per cent. The Act of 1864

[10] *Wool and Manufactures of Wool*, 14.

[11] See a letter from Ammi Willard, a wool agent, in *Moore's Rural New Yorker*, 1 June 1861, and an article by H. D. Tellkampf, a prominent New York wool merchant, in the same paper for 2 Dec. 1865. See also *Report of the Syracuse Convention*, 57.

[12] *Country Gentleman*, 5 Oct. 1865; *Moore's Rural New Yorker*, 18 June 1864, 14 Oct. 1865, 25 Nov. 1865.

[13] *Moore's Rural New Yorker*, 4 Aug. 1860.

[14] *Ibid.*, 15 June 1861.

raised the duty on wool valued at more than 12 cents but not more than 24 cents to 6 cents a pound, and established a minimum duty of 3 cents a pound. This would have been more pleasing to the growers had they not discovered that, contrary to their expectations, some of the mestiza wools of South America were being entered at the 3 cent rate. As the war brought an increase in the wool interest in the East and Middle West, the growers became insurgent.

Their campaign for greater protection was forwarded by the agricultural press and by newly formed wool growers' associations. Among the papers supporting the movement were the *Ohio Weekly Farmer*, edited by S. D. Harris, the *Country Gentleman*, edited by Luther Tucker, and *Moore's Rural New Yorker*, edited by D. D. T. Moore. The last-named paper, published in Rochester, New York, was a well-edited weekly, claiming at the beginning of 1861 a circulation of over 70,000.[15] During the war it added to its features a column on sheep husbandry by Henry S. Randall, an event, which, if we may believe Randall himself, greatly increased the paper's circulation.[16] He had written extensively on the subject (his book *The Practical Shepherd*[17] was a best-seller among farmers) and was himself a wool grower and sheep breeder; a visitor to his farm in Cortland, New York, in 1864 found that he had a flock of 800 thoroughbreds.[18] A high-spirited man of great ability, he entered the arena with gusto, and soon became widely esteemed as the doughty champion of the American wool grower. Declaring that the growers had hitherto been as an unorganized mob before a phalanx, he proposed to change the situation.[19] Sure of his position, bold and decisive in his language, he sought to marshal the scattered forces of wooldom into an effective army. But since he had been trained as a lawyer, and was a man of some political experience, he never closed the door to conciliation and compromise. He recognized the manufacturers' right to protection, "but," he said, "they are not entitled to all the profits." Always he distinguished between the "fair and legitimate interests of manufacturers" and policies hurtful to the growers. He favored the co-operation of the two interests, but argued that there must be equality, and that, to achieve it, pressure must be brought on Congress. On recalcitrant congressmen he

[15] *Ibid.*, 5 Jan. 1861.

[16] Randall to Erastus Bigelow, 8 Feb. 1868, Bigelow Papers, Massachusetts Historical Society.

[17] Published in Rochester in 1863.

[18] *Ohio Weekly Farmer*, 17 Sept. 1864.

[19] *Moore's Rural New Yorker*, 18 June 1864.

preached "a keen and exterminating war." [20] As part of his campaign for the education of congressmen he had already despatched to Justin S. Morrill, a congressman from Vermont whom he had never met, but of whom he was hearing more and more, a copy of his pamphlet on *Fine Wool Sheep Husbandry*.[21]

"The best mode of preserving peace is to be prepared for war — and the best preparation is organization," Randall wrote in 1864,[22] at about the time he was elected first president of the New York Sheep Breeders' and Wool Growers' Association, which had its beginnings at the state fair in Rochester in the fall of that year.[23] The New York organization was one of several that was born during the Civil War. "Do you know that we have a *live* Wool Growers' Association in Ohio?" a farmer of that state was asking in 1863.[24] In that same year an Illinois association was founded, and promptly demanded protection against foreigners and dogs.[25] Vermont and Wisconsin were also among the states claiming associations by the end of the war. Local organizations abounded. A capstone in the form of a national organization was still in the future.

Resolutions, petitions, and letters found their way to Washington. Randall printed for the guidance of his readers a sample petition asking for a wool duty of not less than 10 cents a pound.[26] The wool growers of Addison County, Vermont, sent to Congress "a petition twenty-five feet in length, with columns of names, asking for increased duties on wool." [27] In New York the Onondaga County organization pressed for the 10 cent rate and the Skaneateles Farmers' Club prepared to do likewise.[28] H. C. Meriam, a former editor of the *Boston Cultivator*, wrote to Congressman Morrill that he had come "to the conclusion that the salvation of sheep husbandry in the U. S. (particularly in N. E.) — depends entirely on *substantial protection*. . . ." [29] Thus it is clear that there was a vigorous element among the wool growers of the older states which was not prepared to surrender easily the gains which the war had brought, and was determined to show the manufacturers that "*constituencies*

[20] *Ibid.*, 30 April 1864.
[21] Randall to Morrill, 23 May 1862, Morrill Papers, Library of Congress.
[22] *Moore's Rural New Yorker*, 15 Oct. 1864. This was written after Randall heard that the manufacturers proposed to organize.
[23] *Ibid.*, 1 Oct. 1864.
[24] *Ibid.*, 21 Nov. 1863.
[25] *Ibid.*, 7 Nov. 1863; *Country Gentleman*, 15 Oct. 1863.
[26] *Moore's Rural New Yorker*, 26 March 1864.
[27] *Country Gentleman*, 28 April 1864.
[28] *Ibid.*, 31 March 1864.
[29] Meriam to Morrill, 9 April 1864, Morrill Papers, Library of Congress.

can, on occasion, and in a just cause, make their voices heard as loudly in Congress as a *few hundred* other persons." [30]

Manufacturers could not but view with concern the efforts of the growers. The tariff revision of 1857 had been generally satisfactory to them, and in 1860 they could see no good reason for disturbing it. When Morrill in that year brought forth a new bill, they were shocked. "*Free trade* wd be far prefferable [*sic*] to us," wrote Theodore Pomeroy, a Pittsfield, Massachusetts, manufacturer of woolens, to his congressman.[31] Although Morrill yielded somewhat in the face of protests such as this, the principle of free wool was completely abandoned. In 1864 came further protection for the growers, and it was clear to thoughtful manufacturers that the controversy was not to end there.

No manufacturer found himself more deeply concerned than Erastus Bigelow. By the 1860's he occupied a distinguished position among Massachusetts men of affairs. Inventor and manufacturer, his was an important name in carpets. Early in 1861 he watched events, fearful that the manufacturer would lose the struggle for protection.[32] Shortly after this he undertook to produce a volume, heavily statistical in character, designed to show that for America protection was the best policy. *The Tariff Question Considered in Regard to the Policy of England and the Interests of the United States* presented most of the arguments which protectionists were to reiterate during the succeeding generation.[33]

As a writer on a great public question Bigelow could appeal for a broad policy of protection; as a practical manufacturer it was necessary for him to look after his own interests. In his letters to members of Congress he said little of protection as a principle or of the needs of American industry as a whole: he talked about carpets and of the peculiar needs of that branch of wool manufacture – the need for unrestricted access to foreign wools. A duty on these wools might well cripple the industry unless compensatory duties were placed on imported carpets. In April, 1864, he was writing to Justin Morrill, then on the House Committee on Ways

[30] *Moore's Rural New Yorker*, 15 Oct. 1864.

[31] Pomeroy to Henry L. Dawes, 22 March 1860, Dawes Papers, Library of Congress.

[32] Bigelow to George Lyman, a Massachusetts carpet manufacturer, 26 March 1861, copy in Bigelow Papers.

[33] Published in Boston, 1862. At the outset Bigelow indicated to George Lyman that he would write the book if others would pay the costs. Lyman lined up New England manufacturers behind the scheme. The costs amounted to over $8,000.

and Means, that the proposed increase in wool duties would cost the Bigelow Carpet Company $116,160 a year. He estimated further that, if the increases were adopted, an added duty of 37 cents per square yard would be required to keep the company on the same footing as before in respect to foreign competition.[34] It will be noted that Bigelow was not insisting on free wool but rather on the principle of compensatory duties on woolens to offset the wool duties. In his book he had talked a good deal about the "harmony of interests among the states." Here perhaps was a hint of how that harmony could be maintained.

The controversy over wool duties made congressmen uncomfortable. As a New Englander, Justin Morrill was friendly to wool manufacturers; as the father of tariffs he came into contact with many of them. He even had one of Erastus Bigelow's carpets on his floor – a gift from the manufacturer.[35] But as a Vermonter he could never forget the wool growers – except at his peril. He was ambitious to move to the Senate, and his opponents would quickly exploit the slightest sign of a lack of zeal for the sheep which were the livelihood of rural Vermont.[36] When a Vermonter complained to him that the tariff of 1857 was unfair to growers, Morrill responded bluntly: [37]

> Well, blame yourselves for it. Why didn't you get your statistics and come to Washington and show them to us? The manufacturers were there in their strength. They showed us these things, and they had their influence there; and you wool-growers ought to have been there.

[34] Bigelow to Morrill, 23 April 1864, copy in Bigelow Papers.

[35] Bigelow sent the carpet to Washington for the instruction of the Committee on Ways and Means. Later, when Morrill proposed to buy it, Bigelow presented it to Mrs. Morrill. Bigelow to Morrill, 8 March 1864 and 17 March 1864, copies in Bigelow Papers. Two months later Bigelow informed Morrill that he was sending specimens of carpets concerning which further questions might arise. Bigelow to Morrill, 23 May 1864, draft in Bigelow Papers.

[36] The Morrill Papers, Library of Congress, include several letters written to Morrill during the period of his candidacy by Vermonters interested both in wool and his success. For example, Charles Marsh reported on 4 March 1866 that there was a strong feeling among growers that the tariff treated them unfairly. He added: "And I am sorry to see that there is a disposition to hold you in a measure accountable for the existing state of things." Another Vermonter, J. W. Colburn, in a letter dated 22 Feb. 1866, told Morrill that the rumor was afloat that Morrill could not be relied on by the wool interest because of ownership of manufacturing stock. Morrill replied — 28 Feb. 1866 — that all his woolen stock would not bribe a decent fence-viewer. He indicated that his investments in real estate, railroads, banks, and cotton mills exceeded those in woolen establishments.

[37] *Report of the Syracuse Convention*, 42. This conversation was reported at the Convention by J. W. Colburn.

The increasing inclination of the growers to accept the invitation had not, however, eased the situation for men like Morrill. Another Vermonter, Senator Jacob Collamer, went a step further when, in 1864, he told Erastus Bigelow: ". . . whatever the wool-growers and the wool manufacturers jointly ask Congress to do will be done." [38] Bigelow was the proper man to tell.

In August, 1864, a group of New England wool manufacturers issued a call for a convention to be held at Springfield "for the purpose of consultation, and, if it should be thought advisable, of forming a National Association of Wool Manufacturers, for our mutual interest and advantage." [39] Two meetings were held, in October and November; at the second the association was formed, and 118 members listed.[40] Although his name does not head the August call, it is clear that Erastus Bigelow was the founder of the organization. At the first meeting he was appointed to a committee to prepare a plan of organization. At the second he was elected president. By the following spring he had prepared and published a pamphlet entitled *Objects and Plan of the National Association of Wool Manufacturers. . . .*[41]

A number of straws indicated which way the wind was blowing. At the first Springfield meeting a resolution was adopted, which read thus: [42]

> Resolved, That as this Convention has assembled to represent one branch of American industry, and to adopt such measures as will in their judgment promote the same, yet it entertained no views conflicting with any other branch of industry or interest.

At the first meeting of the Government of the new association three honorary members were chosen: Isaac Newton, Commissioner of Agriculture, Justin S. Morrill, and Henry S. Randall.[43] In his *Objects and Plan* Bigelow took pains to deny that any real opposition

[38] Erastus Bigelow in a speech at the wool trade dinner in Boston, 10 April 1877, *Bulletin of the National Association of Wool Manufacturers*, VII, 182. Hereafter cited as *Bulletin*.

[39] *Ibid.*, XIX, 242.

[40] Ms Minute Book, 1864–1891, in the Boston office of the National Association of Wool Manufacturers. Membership was not limited to those actually engaged in the manufacture of wool.

[41] The pamphlet, published in Boston, was apparently designed to correct the views of some who were already members, to attract new members by overcoming suspicion and indifference, and to reassure other interests.

[42] Ms Minute Book, 1864–1891.

[43] Ms Minute Book, meetings of the Government, 1864–1870, in the Boston office of the National Association of Wool Manufacturers. All three men accepted.

existed "between those . . . who grow a raw material and those who manipulate it. . . ." [44] And, finally, John Lord Hayes was chosen as permanent secretary. Hayes had had years of experience as a lawyer in Washington and knew well the ways of Congress.[45]

Henry S. Randall had followed the reports of the Springfield meetings with great interest. Before the first he had predicted that the manufacturers would not ask for a reduction of wool duties, although the *U. S. Economist* had expected such a request. He was convinced of the need of a moderate policy on both sides, and of the desirability of co-operation. If the manufacturers opened "an aggressive war on the interests of the growers," the growers would face the duty of protecting themselves.[46] After he had read the reports of the first meeting, he called attention to the apparent justification of his earlier prediction.[47] He breathed a mixed note of conciliation and defiance; he had the air of one who hopes for the best but prepares for the worst. After the second meeting he wished the new association well, but issued a stern warning: [48]

> Should it sink into an interested combination, seeking to regulate the prices of wool, making itself felt in politics, besieging the lobby of Congress and attempting to control the tariff legislation of the country for its own benefit, then it will become a scourge to all the other woolen interests of our country, and will invite a struggle differing essentially from preceding ones between the same interests. Heretofore the wool-growers have been a mob against a phalanx. Hereafter it will be, if at all, organization against organization. If the wool growers are ever again forced into such a struggle, they will *attempt* to make their voices heard as loudly in Congress and elsewhere as their opponents!

He refused to believe, however, that the "sound, able and experienced business men" in the association would embark on aggression against other interests.

In September, 1865, the first annual meeting of the new association was held in Philadelphia. The highlight of the meeting was an elaborate address on *The Fleece and the Loom* inspired by Bigelow and written and presented by Hayes. In it the new secretary indi-

[44] *Objects and Plan*, 10.

[45] Hayes was chief clerk in the Patent Office at the time of his appointment. Bigelow, an inventor, had made his acquaintance there. The *Report of the Commissioner of Patents for the Year 1863* (38th Cong., 1st Sess., House Exec. Doc. No. 60), written by Hayes, contains a defense of the patent system, instancing the beneficent results which flowed from Erastus Bigelow's invention of the power loom for weaving ingrain carpets.

[46] *Moore's Rural New Yorker*, 15 Oct. 1864.

[47] *Ibid.*, 22 Oct. 1864.

[48] *Ibid.*, 17 Dec. 1864.

cated that both he and Bigelow were in full touch with reality. He declared: [49]

> There can be no reliance upon a permanent friendly legislation for both interests unless the wool-growers are satisfied. Our object is not to reach Congress, but to convince the farmers of the West, who will inevitably control the legislation of this country, of the absolute identity of our interests. The most important means of extending our manufacture, therefore, is to establish friendly relations with the wool-grower.

New England then, as earlier, lived in the shadow of the expanding West! As means of establishing friendlier relations with the growers he suggested care in choosing wool buyers, abolition of any rule of the manufacturers which was unfair to the growers, increased interest of the manufacturers in encouraging the production of wool suited to their needs, and joint meetings of the two groups. Fourteen years later Hayes wrote that this speech was widely circulated and "aided the favorable reception in the agricultural communities with which our subsequent overtures were met." [50]

Meanwhile Congress had taken a step which made somewhat easier the path of *rapprochement*. Early in 1865 it established a commission to study the revenue system of the United States. During the war the jaws of the Treasury had been ever yawning, and to help satisfy the demands Congress had laid a bewildering multiplicity of taxes. Hoping to bring some order out of the confusion, it instructed the commission to study and report upon the subject of raising the necessary revenue, giving consideration to sources of revenue and to the most efficient methods of raising it. President Lincoln appointed as head of the Revenue Commission a young economist, David Ames Wells. Wells' associates were Samuel Hayes of Chicago and Stephen Colwell, a Pennsylvania businessman and economist, a member of the American Iron and Steel Association, and a close friend of Henry C. Carey, the oracle of the protectionists. By a happy chance John L. Hayes had made the acquaintance of Colwell 15 years before; he was later to acknowledge him as his "first master in Political Economy." [51]

In the division of work among members of the Revenue Commission, Colwell was assigned to the consideration of the revenue problem as it related to wool and woolens. Hayes entered into correspondence with him, telling him of Bigelow's hope of reconciling the two interests. Colwell was most helpful. He favored co-opera-

[49] Hayes, *The Fleece and the Loom*, 63.
[50] *Bulletin*, IX, 235.
[51] *Bulletin*, II, 345.

tion between growers and manufacturers and wrote an official letter to the National Association of Wool Manufacturers in which he asked for information concerning the woolen interests for the use of the commission, and suggested that the association co-operate with the growers.[52] This furnished Bigelow and Hayes with an excuse for inviting Henry S. Randall to a meeting of the Government of the association in New York City in November, 1865.

Randall attended the meeting, at which Colwell was also present. The manufacturers urged Randall to set forth his views in relation to the wool growing interests of the United States, and he, impressed by the "body of experienced and very able men," did so frankly. He recited the charges which the growers commonly made against the manufacturers, and expressed their fears that the National Association of Wool Manufacturers would be a combination detrimental to their interests. He also declared that the growers must receive their share of protection, and told of the growers' organizations already in existence, and the prospects for many more. If the manufacturers wanted the co-operation of these organizations, he felt that they would meet with response. It was a skillful talk, combining, as he usually did, words of conciliation with the rattle of the saber.[53]

But Randall did not stop there. He wished to know precisely how matters stood. Had the manufacturers made any move to change the tariff? Were they thinking of such a move? What changes did they want?

Bigelow and other manufacturers hastened to reply, giving "Mr. Randall the assurance of their desire to establish the most entire cordiality between the manufacturing and wool growing interest." [54] To his first two questions the answer was no. As for desired changes, they were willing to wait until the Revenue Commission had had time to gather information and consider it. What about the growers? Randall was not prepared to answer but "presumed that they too would await action of the Revenue Commission." [55]

The manufacturers undertook to set Randall right as to their motives. They "earnestly repudiated the idea that they sought to depress the producing interest." They thought that a strong wool growing industry was necessary to their own success. They denied

[52] *Ibid.*, John L. Hayes, *Second Annual Report* (Boston, 1866), 4.
[53] *Moore's Rural New Yorker*, 25 Nov. 1865.
[54] Ms Minute Book, meetings of the Government, 1864–1870.
[55] *Moore's Rural New Yorker*, 25 Nov. 1865.

emphatically any disposition to combine to control legislation or prices. Their association was not formed for that purpose and would never be so used.[56]

In response to Colwell's official urging that the two groups get together, the manufacturers invited representatives of the state wool growers' associations to meet with them "for the purpose of consultation in relation to their mutual interests, especially to the representations to be given respecting the wool producing and manufacturing interests before the United States Tariff and Internal Revenue Commission." Randall helped to arrange for a conference at Syracuse, New York, on December 13.[57] He was jubilant and wrote that the New York meeting had been "a white day" in his life.[58]

The Syracuse Convention was an event of first importance. The manufacturers originally had in mind a small meeting attended by their executive committee and a similar group from the growers' organizations. But some of the growers wanted a public convention on a larger scale, and Randall so informed the National Association of Wool Manufacturers.[59] As a result the association invited 50 of its members, in 12 states, to attend with its executive committee.[60] Randall exerted himself to secure delegations from all the state growers' organizations, pressing the growers to send their "ablest and most sagacious men." He pointed out that they would "encounter no second rate men – no captious debaters talking for buncombe – but grave, courteous, experienced men profoundly versed in the subject of the conference. . . ."[61] Since the decision to hold the larger meeting came late, it was not possible to secure as full attendance as the growers had desired.[62] In the end perhaps a hundred men interested in the sheep industry attended, about half of them representatives of wool growers' organizations in New England, New York, Ohio, Wisconsin, and Illinois. About 20 members of the manufacturers' association appeared, including Erastus Bigelow and John Lord Hayes.[63] Randall doubted whether the result

[56] *Ibid.* Randall's account of the meeting is much more detailed than the association's official record.

[57] Ms Minute Book, meetings of the Government, 1864–1870.

[58] *Ibid.* Randall's letter was copied into the association's records.

[59] *Moore's Rural New Yorker*, 6 Jan. 1866.

[60] Ms Minute Book, meetings of the Government, 1864–1870.

[61] *Ibid.* Randall also sent a confidential letter to each president "urging them still more pointedly to send the right kind of delegates." Randall to Bigelow, 17 Nov. 1865, Ms Minute Book, meetings of the Government, 1864–1870.

[62] *Moore's Rural New Yorker*, 6 Jan. 1866.

[63] *The New York Weekly Tribune*, 23 Dec. 1865, is the authority for the

of the meeting would have been any different had there been a thousand growers present.[64]

The council fires of both groups burned in Syracuse the night before the convention. The growers, inspired by their own needs and by the promptings of Bigelow and Colwell, took a step of great importance.[65] The delegates from the state organizations proceeded to organize the National Wool Growers' Association.[66] It was conceived as the "central organ" of the state societies. All members of these groups and of the New England Association were considered members. Randall was chosen president, with an Ohioan as secretary and a Vermonter as treasurer. It may be noted in passing that the organization thus formed was scarcely the "national" association that its name suggested. But "national" was a good word to dangle before Congress and the Revenue Commission.

The meeting began in an atmosphere of good will. Bigelow nominated Randall as presiding officer. The editor of the *Ohio Farmer* nominated Hayes as secretary, and was himself nominated by a manufacturer as an additional secretary. Randall addressed the meeting, and then called upon Bigelow, who responded with a short speech in which he hailed the convention as the beginning of a new era in the relations between manufacturers and growers.[67]

During the course of three sessions the convention ranged over a variety of topics. Wool prices, marketing problems, types of wool, and the mutual interests of the two branches of the wool industry were all discussed fully, as between growers and manufacturers, with intelligence, animation, and good feeling. Any recriminations that arose were between growers, some of whom were said to be divided by rivalries and feuds. Randall let them talk at length, pleased that they did not attack the manufacturers.[68]

The resolutions adopted by the convention exhibit the understanding arrived at by the delegates. The most important of them read as follows: [69]

> Resolved, That the mutuality of the interests of the wool producers and wool manufacturers of the United States is established by the closest of commercial bonds, — that of demand and supply. . . .

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figure 100. The *Report of the Syracuse Convention* lists only 49 delegates from growers' organizations.

[64] *Moore's Rural New Yorker*, 6 Jan. 1866.
[65] *Ibid.*; *Bulletin*, IX, 236.
[66] *Moore's Rural New Yorker*, 6 Jan. 1866.
[67] The meeting is reported in full in *Report of the Syracuse Convention*.
[68] Randall to Bigelow, 20 Dec. 1865, Bigelow Papers.
[69] *Report of the Syracuse Convention*, 37–38.

Resolved, That . . . sound policy requires such legislative action as shall place them on an equal footing, and give them equal *encouragement* and protection in competing with the accumulated capital and low wages of other countries.

Resolved, That it shall be the duty of the respective Executive Committees of the National Manufacturers' and National Wool-growers' Associations to lay before the Revenue Commission and the appropriate Committee in Congress these resolutions, together with such facts and statistics as shall be necessary to procure the legislation needed to put into practical operation the propositions therein set forth.

Both manufacturers and growers were pleased with the results of the meeting. Bigelow expressed his satisfaction, and Randall wrote to him, full of praise for the manner in which the manufacturers had conducted themselves. "I do not believe that our unanimous passage of our resolutions was really & practically our greatest success. It was to meet face to face & learn something about each other. It was to learn that on the questions of difference, something can be said on both sides." [70] Stephen Colwell, having received reports from both Hayes and Randall, wrote, "The progress towards a harmonious result is certainly promising." [71]

Both sides realized that only a beginning had been made. Several years later Hayes pointed out that the harmony engendered by the meeting was "more sentimental than practical. And the agreement was only upon general propositions, which might be differently interpreted by each party according to its interests." [72] Thus it remained to give body to the generalities which had won unanimous assent at Syracuse.

The two executive committees agreed to meet in New York City on 17 January 1866. Randall, of course, headed the growers; Bigelow led the manufacturers. Both committees prepared carefully for the meeting. The growers came to New York several days early to study wools in the office of the United States Appraiser, and in the warehouses of New York importers. Their study satisfied them that the mestiza wools of South America were the principal competitors of American wools.[73] The manufacturers considered what course they should pursue if the growers insisted upon a tariff re-

[70] Randall to Bigelow, 20 Dec. 1865, Bigelow Papers.

[71] Colwell to Hayes, 22 Dec. [1865], probably a copy, Colwell Papers, Library, University of Pennsylvania. This is wrongly dated 1864. It is unsigned, and may be incomplete.

[72] *Bulletin*, IX, 237.

[73] Randall to D. D. T. Moore, 12 Feb. 1866, in *Moore's Rural New Yorker*, 24 Feb. 1866. Although this letter was not meant for publication, Moore printed it when illness prevented Randall's writing a more formal report.

vision. A committee gathered samples of fabrics for examination, reporting weights, prices, and duties.[74]

The manufacturers appreciated the caliber of the growers. Hayes thought Randall "full of talent and knowledge, but jealous and irascible," and he concluded that the others "were no mean antagonists." [75]

The meetings went on for several days without getting down to propositions.[76] At length, pressed by Randall, Bigelow submitted a number of proposals. The growers rejected them, "peremptorily," according to Hayes. The manufacturers then asked for the growers' proposal. Randall issued an ultimatum: 10 cents a pound and 10 per cent ad valorem on all competing wools. The manufacturers refused to consider it unless the growers would agree to adequate compensatory duties on wool fabrics. In the end an adjournment to 6 February was agreed upon.[77]

Bigelow's committee met with manufacturers in Boston and elsewhere, weighing the demands of the growers against the advantages of an alliance. The committee's resolve to yield if the growers would accept added compensatory duties on fabrics encountered no dissent, according to Hayes.[78]

Randall was not idle during the recess. Hearing that the manufacturers had prepared a report to be sent to the Revenue Commission in their own behalf in the event of a breakdown of negotiations, he wrote a hundred-page report for the growers. He circulated a paper describing what had been done to date in order to learn whether the growers would be satisfied with an agreement in line with the terms then being discussed.[79] And he wrote two letters to Justin Morrill, at this time Chairman of Ways and Means, asking

[74] Ms Minute Book, meetings of the Government, 1864–1870.

[75] *Bulletin*, IX, 237–8.

[76] As the meetings got under way, Randall, overcome by excitement and fatigue, was seized with a serious illness and had to withdraw and go to bed. But the meetings went on, the other members of his committee working, as he said, "like heroes." He himself was able to be back again before many sessions were held. Randall had ample reason for being tired. In his letter to Moore he mentions having written over 1,200 letters since the negotiations with the manufacturers had begun. He seems never to have fully recovered from the illness which began in New York. His subsequent activities in behalf of the wool growers had necessarily to be somewhat restricted.

[77] Hayes, *Second Annual Report*, 6–7; *Moore's Rural New Yorker*, 24 Feb. 1866.

[78] Hayes, *Second Annual Report*, 7.

[79] *Moore's Rural New Yorker*, 24 Feb. 1866.

a number of questions in regard to tariffs, and suggesting that Morrill write a reply that could be shown.[80]

Agreement was reached when the committees reconvened. Morrill had written Randall a long, adroit letter, which "did a world of good," the recipient assured him, saying, "The manufacturers growled gently at one or two of your remarks, *but they dare not quarrel with you. . . .*"[81] The congressman made it clear that he was on the side of the growers. He declared that he did not want to cripple the manufacturers but said "they must give the woolgrowers a better chance or they will be deserted by them in Congress and at home – they will not only lose protection but wool will not be grown." He expressed confidence in his ability to co-operate with both groups in such measures as their respective associations agreed to recommend by which the price of wool might be made more satisfactory.[82]

The manufacturers accepted Randall's proposition for a tariff of 10 cents a pound and 10 per cent ad valorem on competing wools. They were careful, however, to nail down firmly the principle of compensatory duties on woolens, which they felt had not, in the past, been fully understood or accepted by the growers, although it had first appeared in the Morrill Act of 1861. The acceptance of this principle without qualification would insure a high degree of stability to the woolen schedule, since in accordance with it, the manufacturer, regardless of changes in wool duties, would always be left in the same position in respect to foreign competition as if he had his wool free of duty. If there was an increase in the duty on wool, an exact equivalent would be added to the compensatory duty on wool fabrics. The manufacturers explained all this carefully to the growers, and the matter was discussed at length.[83] Hayes reports that "the soundness of this principle was fully and frankly conceded" by the growers. Deviations from the Randall proposition suggested by the manufacturers were not concurred in by the growers.[84]

In the end a Joint Report was written by Hayes and sent to

[80] Randall to Morrill, 29 Jan. 1866 [incorrectly dated 1865], and 30 Jan. 1866, Morrill Papers. Randall wanted a letter that could be shown to the growers to counteract efforts being made in Vermont to undermine Morrill's support among the growers. It is evident, however, that he also used the letter to good purpose in the discussions with the manufacturers.

[81] Randall to Morrill, 12 Feb. 1866, Morrill Papers.

[82] Morrill to Randall, 3 Feb. 1866, copy, Morrill Papers.

[83] Hayes, *Second Annual Report*, 8.

[84] *Moore's Rural New Yorker*, 24 Feb. 1866.

Stephen Colwell. It emphasized the new solidarity of the two branches of the wool industry, discussed the desirability of encouraging American wool production, and traversed the tariff history of the preceding 20 years. It concluded with these recommendations: [85]

1. A provision to be inserted in the tariff laws requiring all wools now known as Mestizo, Metz, Cape and Australian wools, to be subjected to a duty of not less than ten cents per pound and ten per cent *ad valorem*. . . .

2. All manufactures composed wholly or in part of wool or worsted shall be subjected to a duty which shall be equal to twenty-five per cent net; that is to say, twenty-five per cent, after reimbursing the amount paid on account of duties on wool, dye-stuffs, and other imported materials used in such manufactures, and also the amount paid for the internal revenue tax imposed on manufactures, and upon the supplies and materials used therefor.

No recommendation concerning a duty on combing wools was made, the committee being unable to agree; the manufacturers in a separate report asked for free combing wools or an increased duty on worsteds. No recommendation was made in respect to carpet wools either, Bigelow's view that domestic growers had small concern with such wools apparently having prevailed. At a later period it was charged that this was the essence of his bargain with the growers: the growers were to write their own ticket in regard to clothing wools provided they were content to allow carpet and combing wools to come in at a nominal duty.[86]

Although Randall had some misgivings about the Joint Report – and at Colwell's request, submitted a separate report also – he professed in public to be well satisfied. *"The Manufacturers have kept faith with us,"* he wrote in the letter published in *Moore's Rural New Yorker*. He confessed that he could not see any benefits to the manufacturer aside from an increased wool supply, friendship with the growers, and the prospects of stable legislation. "On the other hand," he said, "*we* gain much – all that we have a right fairly to ask." [87] Randall's role was that of leader of the moderates among the wool growers; his statements must be read in the light of his need to justify his leadership.

[85] *Joint Report of the Executive Committee of the National Association of Wool Manufacturers, and of the Executive Committee of the National Wool Growers' Association, Addressed to the United States Revenue Commission, Feb. 9, 1866* (Boston, 1866), 22–23.

[86] For example, see a letter from H. N. Slater in the *Nation*, XXVI, 14 March 1878. The feeling that users of clothing wools did not get a fair deal caused many manufacturers to withdraw from the National Association of Wool Manufacturers and kept others from joining.

[87] *Moore's Rural New Yorker*, 24 Feb. 1866.

The Syracuse Convention had effected agreement on broad principles. The Joint Report had formulated in more concrete terms the demands of the two interests. But a third and more important step remained: the drafting of a bill complete in all particulars.

There was some friction over who should draw up the tariff schedules, and Randall determined to go to Washington. He stayed there for five weeks, working with other members of the growers' executive committee, which consulted congressmen, Colwell, and representatives of the manufacturers. At the end of that time a draft of a wool schedule was submitted to Colwell in the name of the National Wool Growers' Association.[88]

The growers were primarily interested in devising a system whereby competitive wools would pay the full duty intended. The schedule which emerged represented a new departure. For the first time wools were subjected to a careful classification. Three distinct classes were established: clothing wools, combing wools, and carpet wools. Duties were provided for in accordance with class and value within class. Clothing wools, being considered the most competitive, bore heavy duties. Furthermore, in this class only, double duties were levied on washed wools. Combing wools carried similar duties except for double duties on washed wools. Carpet wools had the lowest duties of all – 3 cents a pound for such wools valued at 12 cents or less.[89]

Meanwhile the manufacturers were having a difficult time framing a schedule for their products. The industry was far from being a unit; it embraced the manufacture of such different items as woolen cloths, worsted goods, hosiery, hats, carpets, yarns, and bunting. Each product had to be considered separately and a duty arrived at satisfactory to its manufacturers.

Bigelow and Hayes were the leaders in accomplishing the task. Bigelow had his hand in every activity, meeting the manufacturers, making the calculations on which rates were based, drafting the proposed measure, and preparing a detailed statement and explanatory key to accompany it.[90]

The most notable feature of the manufacturers' schedule was the elaborate system of compound duties. A specific duty was designed to be compensatory – to offset the wool duties. An ad valorem duty was established to give in most instances an ostensible net protec-

[88] "Report of the executive committee of the National Wool-growers' Association . . . ," in *Reports of the Revenue Commission*, 430–41.

[89] *Ibid.*, 440–1.

[90] *Bulletin*, IX, 239–40.

tion of 25 per cent. But since it was assumed that four pounds of wool entered into the making of a pound of cloth, the compensatory duty was at times considerably more than adequate. The report of the manufacturers acknowledged that two pounds of wool would make a pound of worsted cloth, but they nevertheless asked for a compensatory duty on worsteds based on the four-pound rule, pleading the needs of an infant industry. The duties as worked out for carpets, while conforming ostensibly to the principle of a 25 per cent net protection, represented a considerable increase over the duties laid by the act of 1864. The manufacturers, on the whole, arrived at duties which gave them considerably more protection than would have resulted had an impartial economist been set at the task of translating the recommendations of the Joint Report into a schedule of rates on the manufactures of wool.[91] This surely warrants the conclusion that, although George William Bond, a Boston wool dealer, may have been right when he said that the law of 1867 was imposed upon the wool manufacturers by the wool growers,[92] nevertheless the experience was, for the manufacturers, not wholly bitter.

The report of the Executive Committee of the National Association of Wool Manufacturers was submitted to Colwell in May, 1866. Colwell lost no time in completing his report to the Secretary of the Treasury. It included the full stenographic report of the Syracuse Convention and the various other documents which growers and manufacturers had submitted to him. He declared that the interests of both groups had been "subjected to a scrutiny so patient, so intelligent, and so discriminating, that the utmost deference and weight is due, and should be awarded, to conclusions so carefully prepared." [93]

In June, Erastus Bigelow, tired after the months of arduous labor, sailed for Europe, not forgetting before he left to write a letter to Randall expressing to that gentleman his great personal esteem.[94] His lieutenants and his allies prepared to fight the battle of Washington.

The battle was hard-fought, and involved two phases. In the first, which occurred in the summer of 1866, only the manufacturers maintained a lobby at the capitol. Hayes and Nathan Kingsbury, a

[91] "Statement of the executive committee of the National Association of Wool Manufacturers. . . ," in *Reports of the Revenue Commission*, 441–54.

[92] *Wool and Manufactures of Wool*, lx.

[93] "Special Report No. 13," in *Reports of the Revenue Commission*, 353.

[94] The nature of Bigelow's letter, which has not come to light, is inferred from Randall's reply, 23 July 1866, Bigelow Papers.

Hartford manufacturer, undertook to convince the Committee on Ways and Means of the propriety of the wool and woolens schedules which had come from the Revenue Commission.[95] They were sufficiently persuasive: Morrill incorporated the schedules in the general tariff bill which he was preparing, with only a nominal reduction in the compensatory duties; this reduction was, no doubt, a gesture toward the wool growers of Vermont, who had not yet made up their minds concerning their congressman's loyalty to sheep. In introducing his bill Morrill stressed the demands of the growers, declaring that never since he had been in the House had so many petitions been received upon any subject.[96] Although the House passed the bill with considerable speed, it was tabled by a hot, tired, and politically minded Senate. Thereupon John Bingham, a prominent Ohio congressman, introduced the wool and woolens schedules as a separate bill. Once again the House responded and the Senate tabled. Thus Congress adjourned with two tariff bills — the general bill and the Bingham bill — reposing in the Senate, awaiting the second session.[97]

During the summer and fall a number of pertinent events occurred. The Revenue Commission came to an end. David A. Wells, who had been its head, became Special Commissioner of the Revenue and set about, under the direction of Secretary McCulloch, preparing a tariff bill to offer Congress as a substitute for the unsatisfactory measure which had passed the House.

In September, Wells by invitation presented to the Government of the National Association of Wool Manufacturers his views on the tariff,[98] "the most important . . . being that it was for the interest of manufacturers, that the duty on raw material should be as light as possible, and that the tariff upon wool should not be increased." If Wells expected to break down the alliance between growers and manufacturers, he was doomed to disappointment. He was informed that these views were inconsistent with the policy to which the association had been solemnly pledged.

At a convention in November, the National Wool Growers' Association voiced its support of the wool and woolens schedules of the pending bill and set up a committee to represent it in Washington

[95] Hayes, *Second Annual Report* has a full account of the campaign. For an interesting sidelight on Hayes as a lobbyist see a letter from him to his wife, written 17 June 1866, quoted in Hayes, "General Garfield and His Services to the National Wool Industry," *Bulletin*, XI, 283–4.

[96] *Congressional Globe*, 39th Cong., 1st Sess., 28 June 1866, 3,466.

[97] Hayes, *Second Annual Report*.

[98] Ms Minute Book, meetings of the Government, 1864–1870.

at the next session of Congress.[99] Present at the meeting, in behalf of "harmony and concert of action," was a member of the National Association of Wool Manufacturers. The Executive Committee of the latter organization, meeting to consider what course should be pursued, concluded that the association should support the Bingham bill only in the event that the general measure failed to pass. They explained the matter thus: "The Committee regard the interests of the wool manufacture as identified with the prosperity of all the industrial interests of the country; and they would not separate themselves from other interests in asking protective legislation, except as a last measure of self-preservation." [100] This policy was endorsed at the annual meeting of the association.

Representatives of both growers and manufacturers were present in Washington for the second campaign.[101] As soon as it was learned that the Senate Finance Committee would consider the tariff during the Christmas holidays, the lobbyists of both organizations made an appointment with Chairman Fessenden for their appearance at its first tariff session. Accordingly, on 21 December, Hayes and Kingsbury for the manufacturers and R. M. Montgomery, from Ohio, and A. M. Garland, from Illinois, representing the growers, stated their case at length to the patient committee. It was an historic scene: for the first time in American legislative history wool growers and wool manufacturers pleaded their cause together.[102]

The draft of a bill prepared by David A. Wells soon threatened the careful work of the allies. In a report accompanying his bill Wells made a devastating attack on the wool and woolens schedules of the House bill of the previous session, currently before the Senate Finance Committee. He estimated that under it the American consumer would pay an annual tax of $71,250,000 for the protection of a wool industry whose product had an annual value of $36,000,000. He denied, moreover, that the proposed duties would afford the relief intended. He argued that Western domestic wools would be as serious a threat to the Eastern grower as the wools from abroad.[103]

The friends of the Wells bill sought to have it adopted by the Finance Committee as a substitute for the House bill in the guise of an amendment. But the growers triumphed over Wells, proving

[99] *Moore's Rural New Yorker*, 8 Dec. 1866.
[100] Hayes, *Second Annual Report*, 16.
[101] John L. Hayes, *Third Annual Report* . . . (Boston, 1867); *Moore's Rural New Yorker*, 19 Jan. 1867, 30 March 1867.
[102] Hayes, *Third Annual Report*, 5.
[103] U. S. Senate, 39th Cong., 2nd Sess., Exec. Doc. No. 2, Special Commissioner of the Revenue, *Report* (Washington, 1867), 50–60.

too strong to be trifled with. Although the Finance Committee did report a substitute in the form of an amendment, it left the wool duties of the House bill virtually untouched. The manufacturers did not fare so well, but they decided to wait until the measure returned to the House before pressing for amendments.[104]

When the Senate bill reached the House Committee on Ways and Means, Hayes and Montgomery demonstrated once more the solidarity of the interests by appearing before the committee together. Hayes read to the committee a pamphlet which he had written in support of the original House bill.[105] In it he discussed the understanding between growers and manufacturers and argued that the provisions of the House bill had "received public commendation," having been approved by the House, endorsed by growers and manufacturers, and subjected to no opposition except from "that foreign or importing influence whose aggressions they were designed to check." Expressing regret at the way the Senate changes had "disturbed the harmony of the arrangement . . . and materially maimed the symmetry of the House provisions," he went on to illustrate the defects of the Senate bill. Accompanying Hayes were three carpet manufacturers, all association men, who entered a special plea in behalf of their industry.

Trailing Hayes' lengthy exposition in the pamphlet, was a brief note addressed to the Committee on Ways and Means by Montgomery and two other representatives of the growers. They declared that although the Senate had adopted the House wool schedule they believed that the "good faith and interest" of the growers required that the woolens schedule of the House bill be restored also.[106]

The Committee, apparently convinced, made changes favorable to the manufacturers. But it was now too late in the session to get the general measure adopted. Morrill was called to Vermont by his mother's illness, and the outlook for passage worsened. Frantic telegrams were despatched to Vermont by both wool growers and wool manufacturers, begging Morrill to return.[107] At length he yielded. Back in Washington he took charge of the battle, and according to

[104] Senator E. D. Morgan to Randall, 23 Jan. 1867, New-York Historical Society; Hayes, *Third Annual Report*, 7.

[105] Hayes, *Third Annual Report*, 7.

[106] John L. Hayes, *Considerations in Favor of the Provisions of House Bill No. 718, Respecting the Duties on Wool and the Manufactures of Wool . . . Accompanied by a Statement in Behalf of the National Wool Growers' Association* (Washington, 1867).

[107] *Moore's Rural New Yorker*, 30 March 1867.

Randall, "his determined onset . . . gave momentary hope of a successful issue. . . ." [108] But too many amendments had been made, too much opposition aroused. Amid scenes of confusion the House voted. Soon "the final and hopeless defeat of the bill was announced by telegraph to all parts of the country." [109]

Other interests might accept defeat, but not wool and woolens. During the next 48 hours the strength of the alliance and the superiority of its strategy were demonstrated.[110] Hayes, Kingsbury, and Montgomery determined to resurrect the Bingham bill, then "lying in the Senate, like a shell shot in a former fight, covered from notice by the debris of later battles." They set to work at once. First they persuaded Ohio congressmen to visit Senator John Sherman, asking him to try to get the bill reported from the Finance Committee, of which he was a member. Early the next morning they themselves pressed the matter before the committee. Sherman promptly reported the bill, at first with some amendments which he quickly withdrew when told that an amended bill would stand no chance in the House as the session neared its end. The allies meanwhile worked on the senators, "particularly those from the wool-growing states." In the end they triumphed: the Senate passed the bill in exactly the form in which it had arrived months before from the House.[111]

The friends of the wool growers had passed the bill. It did not need the support of any of the leading industrial states. Both Massachusetts senators, and one from Rhode Island, voted against it. Randall thought that their votes would "attract attention and surprise," [112] but it would seem that he had not understood Hayes' strategy. That Hayes made no great effort to secure Eastern support is indicated by his remark that "votes of Eastern senators, it is believed, would have been secured for the bill, if necessary for its success." [113] The secretary had perhaps committed to memory a favorite saying of Erastus Bigelow, "It is a great thing to know what not to do."

There was one more hurdle to pass. When Andrew Johnson came down to the capitol in the closing hours of the session he had not made up his mind whether to sign or veto the bill, which he considered a villainous measure. Both Wells and McCulloch had rec-

[108] *Ibid.*
[109] Hayes, *Third Annual Report*, 9–10.
[110] Hayes, *Third Annual Report*, 10–12, details the steps taken.
[111] *Congressional Globe*, 39th Cong., 2nd Sess., 2 March 1867, 1,958.
[112] *Moore's Rural New Yorker*, 30 March 1867.
[113] Hayes, *Third Annual Report*, 12.

ommended his acceptance of it despite the fact that Wells considered it "about as bad as it well can be. . . ." [114] Their advice sprang from their hopes and fears – fear of the personal consequences of a veto [115] and of getting something worse in tariff legislation the next session,[116] hope of breaking the protectionist front by separating wool growers and wool manufacturers from the iron people and others.[117] At the capitol the President disposed of bill after bill as the minutes ticked away, the wool and woolens bill pushed aside. Outside the room where the President worked, Hayes and his friends waited anxiously. Fearing the worst they sent for Judge Bingham and Columbus Delano, both Ohio congressmen and friends of the growers; the two legislators conferred with the Attorney-General, another Ohio man, and persuaded him to urge the President to sign.[118] Finally, at the last moment, protesting "that he did not at all like the measure," Andrew Johnson signed his name.[119]

Among the allies compliments were the order of the day. Randall declared that the manufacturers had kept faith, and praised their work and that of "their indefatigable and talented Secretary. . . ." [120] In a discussion at their state fair several speakers, sheepmen and Vermonters all, declared that the wool tariff could not have been obtained without the help of the manufacturers.[121] Hayes in his turn had naught but praise for the wool growers.[122]

The Wool and Woolens Act was not the only legislation of the thirty-ninth Congress which pleased the National Association of Wool Manufacturers. A general tax bill was passed, and included in it was a reduction of the tax on wool manufactures from 5 to 2½ per cent – a relief not given to other manufactures. The provision was in the bill when it emerged from the Committee on Ways and Means. Hayes said that the reduction was proposed by a Western congressman who sympathized with the wool manufacturers al-

[114] Wells to Edward Atkinson, 6 March 1867, Atkinson Papers, Massachusetts Historical Society.

[115] *Ibid.*

[116] Wells to Atkinson, 5 March 1867, Atkinson Papers.

[117] *Boston Daily Advertiser*, 5 March 1867. In his 5 March letter to Atkinson, Wells remarked: "The Iron and other interests are a good deal dissatisfied, and say that the *two best horses have been taken out of* the tariff team — which will make the road the harder to travel."

[118] Hayes, *Third Annual Report*, 13; National Wool Growers' Association, *Secretary's Report*, January, 1879 (1879), 8.

[119] *Boston Daily Advertiser*, 5 March 1867.

[120] *Moore's Rural New Yorker*, 30 March 1867.

[121] Hayes, *Third Annual Report*, 27–28.

[122] *Ibid.*, 17.

though he opposed "a general protective policy." Hayes expressed the opinion that this favor to the manufacturers was the consequence of concessions made by them to the growers, who were influential with the committee, and he said, "The reduction . . . may therefore be claimed as the direct result of our policy, and the first-fruits of the labors of our Association." [123] It was no small victory: if production was sustained the cut would mean a saving of over $3 million a year to the industry.[124]

An incident connected with putting the new law into operation, however, showed that sentiment and success had not wholly dissolved suspicion. The law provided that samples of the different types of wool should be placed in the customs houses as standards by which to appraise incoming wools. Secretary McCulloch appointed George William Bond, the Boston wool merchant, to prepare the samples. This was an excellent appointment since Bond was thoroughly familiar with wools and also thoroughly honest. But he was a member of the National Association of Wool Manufacturers, and to the growers his appointment suggested an attempt to cheat them of their victory. Randall expressed to McCulloch the "alarm and dissatisfaction" of the growers at the newspaper reports.[125] Justin Morrill, now a Senator, took the matter up with the Treasury Department, suggesting that a committee of growers and manufacturers pass on the samples before adoption.[126] McCulloch agreed to give both groups an opportunity.[127] On 22 May five growers, three manufacturers, two appraisers and another Treasury representative met with Bond in Boston. Bond had a set of 84 samples ready for each man, and several hours were devoted to their examination. The work had been well done, and everyone was satisfied; a resolution was passed approving the samples. Hayes doubtless spoke with feeling when he told the Government of his association: "It is a subject of sincere congratulation, that the last question which can arise for a long time between the two interests has been finally disposed of." [128]

Somewhat more than a year after its first great victory the alli-

[123] *Ibid.*, 8.

[124] *Congressional Globe*, 39th Cong., 2nd Sess., 13 Feb. 1867, 1,218. The following year the National Association of Wool Manufacturers participated in a movement which led to the repeal of the remaining tax on the woolen industry, as well as that on other industries.

[125] Randall to McCulloch, 23 March 1867, in *Moore's Rural New Yorker*, 20 April 1867.

[126] Morrill to Randall, 29 March 1867, New-York Historical Society.

[127] *Ibid.*; McCulloch to Randall, 8 April 1867, New-York Historical Society.

[128] Hayes, *Third Annual Report*, 21.

ance was put to the test. In 1868 the revival of the reciprocity treaty with Canada was being discussed. The National Association of Wool Manufacturers at first took no stand, attracted perhaps by the prospect of reduced duties on combing wools. But Henry Randall let it be known in no uncertain terms, in *Moore's Rural New Yorker* [129] and in a private letter to Erastus Bigelow, that he expected the wool manufacturers to be faithful to the alliance. And he insinuated a suggestion calculated to bring cold chills to manufacturers who had spent so much time and money in getting the act of 1867: "A change of duties on combing wools would call for a change in the duties on foreign fabrics made of combing wool, & when Congress starts tinkering the tariff there is no telling where it will stop." [130]

The association considered the matter at length, and at its annual meeting, following Randall's suggestion, it put itself on record as opposing the renewal of the reciprocity treaty.[131] The reasons offered were that it would check the growth of combing wool in the United States, thus offsetting any temporary advantage which the worsted industry would gain from its adoption, and that it would violate the spirit of the manufacturers' agreement with the growers. Randall forwarded this resolution and resolutions of the National Wool Growers' Association to the State Department, which referred the matter to the Treasury for comment. Secretary McCulloch informed Secretary Seward that he did not see that he could add force to what the resolutions stated, unless it was to add that he believed that questions bearing on rates of duty should be kept out of treaties.[132] The treaty was not renewed.

Thus, as the decade of the 1860's ended, organized co-operation between wool growers and wool manufacturers had become a practical reality and a political power. Symbolic of the interdependence of the two groups and their alliance, is the coat-of-arms of the National Association of Wool Manufacturers. It shows three shuttles on a field of gold surmounted by a merino ram. (The model was Edwin Hammond's famous Vermont ram, Gold Drop.) Underneath is the motto, "The Fleece and the Loom."

[129] 19 Sept. 1868, 10 Oct. 1868.
[130] Randall to Bigelow, 1 Oct. 1868, Bigelow Papers.
[131] *Bulletin*, I, 19–20.
[132] Hugh McCulloch to William H. Seward, 22 Jan. 1869, New-York Historical Society.

By Kendall Beaton
SHELL OIL COMPANY

Dr. Gesner's Kerosene: The Start of American Oil Refining

Accounts of the "birth of the petroleum industry" traditionally have emphasized the discovery and exploitation of early oil fields. Equally important, however, was the growth of a market for the production of those fields. Little information has hitherto been available about Dr. Abraham Gesner and his Kerosene Works. Here was one of the significant origin points for a major industrial development. Gesner's story, interesting in itself, contributes greatly to an understanding of all phases of the early petroleum industry.

I

Oil historians commonly date the birth of the modern petroleum industry from an August afternoon in 1859 when E. L. Drake brought in a small, shallow oil well at Titusville, Pennsylvania. This relatively insignificant event led to the immediate start of a large and flourishing business for one reason only: the facilities to convert petroleum into a salable product already existed in substantial number, and the business of distributing that product to the customer had during the previous five years assumed the proportions of a substantial commerce. It was, indeed, the very profitability of this hydrocarbon oil trade that had led Drake's backers to seek out a "petroleum spring" in the back country of Pennsylvania and provide him with the funds to drill what was, for its day and depth, an expensive oil well.

By the fall of 1859,[1] there were in this country at least 33 "coal-oil" refineries actively engaged in the manufacture of hydrocarbon illuminating oils that differed very little in chemical composition from the petroleum-based illuminants that would shortly displace them. By far the largest of these coal-oil works was the pioneer plant of the New York Kerosene Oil Works, located on the east bank of Newtown Creek in what is now the Borough of Queens. The Kerosene Works had first gone into operation five years earlier, in

[1] *Hunt's Merchants' Magazine and Commercial Review*, Vol. 42 (New York, 1860), 245–6.

1854, and was, at the time Drake completed his oil well, an enterprise of sufficient substance to command a lengthy notice in the New York *Commercial Advertiser*.[2]

Father of this enterprise, which others had been so quick to emulate, was Dr. Abraham Gesner, Nova Scotian by birth, and by turns physician, surgeon, naturalist, geologist, chemist, author, and inventor. Because the success of Dr. Gesner's enterprise played so large a part in launching the modern petroleum industry, it may be appropriate at the distance of a century to inquire briefly into the good doctor's life and works, for his fame has suffered somewhat at the hands of oil historians, largely because his career in this country was short, his connection with the industry he started was brief, and information concerning him has been scanty and difficult to obtain.

To evaluate the importance of Gesner's contribution in providing the push that started this new industry, we need to consider for a moment the state of the illuminating oil trade in the quarter century preceding 1850. For at least 200 years, whale oil had been considered the most satisfactory illuminant available. When burned in the circular-wick Argand lamp,[3] the oil of the sperm whale gave off a fine, clear light. But as the supply of whales diminished and the American whaler found it necessary to go farther and farther in search of his prey, the price of whale oil began the steady climb that brought a temporary "golden age" to the business of whaling – and concerted efforts on the part of others to find cheaper substitutes for whale oil.

By 1850, the oil of the sperm whale was fetching $2.00 to $2.50 a gallon and the inferior "whale oil" (made from the right whale) $.75 to $1.00.[4] By the early 1800's – when Nantucket captains were erecting stately houses from the profits of a single whaling voyage – the average American householder was turning to lard oil on a large scale. Then, as early as 1825, came the first of the "artificial" hydrocarbon oils, manufactured from a wide range of materials: benzene (1825),[5] a by-product of the new coal-gas works then just getting under way; "rosin oil" and "burning fluid," made from pine pitch

[2] 24 Aug. 1859.

[3] Perfected in the 1780's by the Swiss physician and chemist, Aimé Argand (d. 1803).

[4] Joshua Merrill's Reminiscences in *The Derrick's Hand-Book of Petroleum* (Oil City, Pa., 1898), I, 880–90; bills of sale in the Bella C. Landauer Collection, New-York Historical Society.

[5] F. W. Robins, *The Story of the Lamp (and the Candle)*, (London, 1939), p. 110.

and other resins; and camphene, a purified oil of turpentine, distilled over quicklime to free it from resin. Camphene had a tendency to smoke, unless it was burned in a lamp with a strong draft. In order to improve its burning properties and increase its supply, it was generally mixed with alcohol.[6] The resultant mixture (also called camphene) was highly volatile, extremely inflammable, even explosive. To burn it with any degree of safety required a special lamp having two wicks and evaporation caps to cover them when not in use. Even with these drawbacks, camphene became a relatively popular illuminant in the years following 1830, as any antique collector can attest from the multitude of camphene lamps that were made and sold.

There was, obviously, room for a successor to camphene: a hydrocarbon oil that would burn with the brilliance and safety of whale oil, and yet sell for a fraction of whale oil's cost. Beyond doubt, many who left no records of their attempts must have brought forth and sold on a limited scale oils which they hoped would be cheaper, brighter, or less dangerous to use. A chief obstacle in the way of most of these would-be innovators was that they were "practical" men with little schooling and no knowledge of even the first principles of chemistry. Without such knowledge, their efforts were doomed to failure, for any of these oils needed to be "rectified" or "refined" to remove the objectionable substances that caused poor combustion and foul odors in burning. When, finally, satisfactory substitute oils did make their appearance just before the Civil War, they were the work of trained chemists.

Of prime importance in this collective groping for the right answer to a problem posed by economics (a process that seems to be repeated in the case of almost every innovation, as isolated men, working in ignorance of each other, proceed by similar routes to similar solutions) was the work of Dr. Gesner. He provided a satisfactory substitute for existing illuminants; he coined the name by which these oils would be known; and he set in motion the all-important example of a successful commercial venture.

II

Abraham Gesner[7] was born at Cornwallis, Nova Scotia, 2 May

[6] *Ibid.*

[7] Biographical material chiefly from Anthon Temple Gesner, *The Gesner Family of New York and Nova Scotia* (Middletown, Conn., 1912), p. 12 ff; G. W. Gesner, "Dr. Abraham Gesner, A Biographical Sketch," *Bulletin* of the Natural History Society of New Brunswick, XIV (1896), 3–11; G. F. Matthew,

1797, one of 12 children of Henry Gesner and Sarah Pineo.[8] Raised in such a large family, young Abraham could expect no better education "than the ordinary instruction of the grammar schools of the day,"[9] which, his sons tell us, he received. He was, however, "always a great reader and diligent student" and early began to increase his store of knowledge by self-education.

Of young Abraham Gesner's activities between the end of his school years and his marriage in 1824, at the age of 27, we know little. A diary he started on his twenty-first birthday (unhappily now lost), contained, according to his son, accounts of horse-trading ventures. Gesner undertook to transport Nova Scotia and New Brunswick horses to the West Indies, and in the course of these voyages was twice shipwrecked. These ventures, far from yielding the anticipated profits, were a financial failure and young Gesner must have had little beyond his own native intelligence, sound health, and good sense to recommend him to his new father-in-law, Dr. Isaac Webster, of Kentville, Nova Scotia.

Marriage to Harriet Webster was a turning point in Gesner's career; a year later we find him, at 28, in London embarked upon the study of his father-in-law's profession. For three years, he "walked the hospitals," as the phrase went, acquiring his education in surgery at Guy's Hospital, London, and his medical instruction at St. Bartholomew's. Gesner qualified as a doctor of medicine in London

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"Abraham Gesner, A Review of His Scientific Work," *Bulletin*, N.H.S.N.B., XV (1897), 3–48.

[8] Gesner's great-grandfather, Johan Hendrick Gesner (1679–1745), had come to New York from the Palatinate of Germany in June, 1710, and had settled near Tappan, New York. Johan Gesner (whose middle name was probably spelled *Heinrich* originally) was one of the thousands of starving Palatines who had made their way to England and to the British Colonies as a result of the generous invitation of Queen Anne. E. B. O'Callaghan, *Documentary History of New York* (Albany, 1850), III, 563, presents "A List of the Palatines Remaining at New York, 1710," some 420 of them supported from November, 1710, to June, 1711, at public expense (p. 568). On the list is Johan Henrich "Gossinger," 31, his wife and two-year-old daughter. (Anthon T. Gesner's Genealogy [1912] confirms that Gesner is meant.) Abraham's grandfather, John Henry Gesner (1724–1811), lived and died near Tappan, and Abraham's father, Henry Gesner (1756–1850), was born there. Henry Gesner, a young man of 19 at the outbreak of the American Revolution, enlisted with his twin brother in the King's Orange Rangers (a Loyalist corps from Orange County, New York), which was quartered in Nova Scotia from the time of Saratoga to the end of the war. The British government rewarded the Gesner brothers with grants of land in Nova Scotia. Henry's allotment had been a 400-acre tract in the Cornwallis Valley, where he settled in 1786 and married Sarah Pineo, a young lady of Huguenot and Pilgrim stock, from Providence, Rhode Island, who was like himself a fugitive from the fortunes of war.

[9] Quotations are from G. W. Gesner, *loc. cit.*

in 1827, and returned home with his newly-won degree to settle in the pleasant little village of Parrsboro, Nova Scotia, across the Minas Basin from his old home. There he hung out his shingle and began the life of a country doctor.

The shores of the Minas Basin were particularly well supplied with finely crystallized rocks; Dr. Gesner, making his rounds on horseback, developed the habit of picking up specimens that caught his eye, and often returned home, his saddlebags crammed with specimens. The science of geology was then in its formative years and Gesner read eagerly the geological writings of Buffon, Werner, Hutton, Burnet, Conybeare, Phillips, Mohs, Brongniart, Buckland, Lyell, and any others he could lay his hands on. He read the essay on "The Geology of Nova Scotia" by the Boston professors Charles T. Jackson and Francis Alger, published in 1831, and began a correspondence, which he would continue for the rest of his life, with leading scientific men of his day in Europe, Canada, and the United States.

As a result of this reading, theorizing, and on-the-spot investigation, Dr. Gesner began to write a geology book of his own, and in 1836 brought out at Halifax *Remarks on the Geology and Mineralogy of Nova Scotia*, 313 pages, the first work to attempt a detailed application of modern geological theories to that area. The book was written in popular style and displayed Gesner's ability to express a complicated idea in simple language, a feature that would distinguish all his subsequent writing.

He did not overlook the practical aspects of geology, devoting several pages to newly-opened coal mines and undeveloped iron deposits. In this report, as in the ensuing work he would undertake, we see Gesner absorbed in the practical applications of geology – hunting out mineral deposits of commercial value, estimating their probable worth, and attempting to point the way to their successful exploitation. From this point onwards, geology and the sciences connected with it were to be Dr. Gesner's chief interest, with the profession of medicine relegated to the role of breadwinner.

Remarks on the Geology and Mineralogy of Nova Scotia marked the beginning of a second phase in Dr. Gesner's professional career. In 1838, he was appointed Provincial Geologist of the Province of New Brunswick,[10] moved his home to Saint John, and set to work to make a detailed geological examination of the province, again

[10] "The first [geological survey] undertaken by a provincial government in Canada; or, so far as I know, in any British colony" — President's Annual Address, *Bulletin*, N.H.S.N.B., IX (1890), 34.

with emphasis on mineral deposits susceptible of commercial utilization. Gesner threw himself into this work with enthusiasm, only to reap disappointment and public embarrassment five years later. But it was the work that set him on the trail to his "invention" of Kerosene.

The first of his official reports, *First Report on the Geological Survey of New Brunswick*, was published at Saint John in 1839, and was followed by similar reports in 1840, 1841, 1842, and 1843. On foot, on horseback, and by canoe, he pushed through the forests of the province, and, accompanied by Indian guides, paddled up its streams, plotting dip and strike, gathering specimens, analyzing finds, theorizing, and – always – keeping a sharp eye out for coal, zinc, lead, iron, manganese, copper, gypsum, salt, and any other mineral deposit which might have, or might be made to have, some commercial value. In charming contrast to geologists of a later day, Dr. Gesner saw no reason why he should not employ in his reports whatever literary skills he possessed to describe in vivid fashion the sights and sounds he encountered in his explorations. (His geology, though, is today valuable chiefly as a curiosity, for geologic theory continued to develop during Dr. Gesner's lifetime, and before his death, most of his earlier beliefs and theories had been outmoded.)

As a consequence of Dr. Gesner's geological surveys, local interests opened coal mines in Queens County, N.B., and built iron furnaces at Woodstock, N.B., a few miles east of Houlton, Maine. When these ventures did not prove as profitable as their promoters had anticipated, because of low-grade ores and great distance from markets, the wrath of the unhappy investors was directed at Dr. Gesner. The provincial government abruptly terminated his employment as provincial geologist in 1843, and even withheld payment of his last year's salary for more than a year. As a result, his large geological map of New Brunswick, in preparation since 1838, was never finished.[11]

After the termination of his geological appointment in 1843, Dr. Gesner moved his family back to the Gesner homestead at Cornwallis, Nova Scotia, in order to be with his father who was then

[11] During his residence at Saint John, Dr. Gesner amassed a large collection of geological specimens and native animals, which he stuffed and mounted himself. This collection became in 1842 the Gesner Museum, and was later (1889) incorporated into the collections of the New Brunswick Natural History Society, now the New Brunswick Museum, of Saint John. It was also during this period that Dr. Gesner was elected a fellow of the Royal Geological Society of London.

87 years old. He engaged in such medical practice as the country offered, wrote, lectured, and continued his experiments in the practical sciences. It was here, on the family farm, some time about 1845 that Dr. Gesner first turned his hand to the manufacture of an "artificial" lamp oil. Here his prior knowledge of yet another science, chemistry, served him in good stead. As a medical man, Dr. Gesner had of course an acquaintance with chemistry, and his more recent experience as a practicing geologist had no doubt obliged him to become thoroughly familiar with chemical testing procedures.

What first set Gesner upon his new lamp oil enterprise, we can only speculate. We do know that 30 years earlier, on his horse-trading trips to the West Indies, he had missed no opportunity to "take in" the natural wonders of the islands. In 1818, he had visited the "tar springs" on Barbados [12] and on this, or another voyage, had called at Trinidad and made a close inspection of the famous "Pitch Lake." [13] Barbados tar and Trinidad pitch were both, as Gesner pronounced them, natural asphalts formed by the drying out of a petroleum seepage, or spring.

The Trinidad "Pitch Lake" was a seepage of enormous dimensions, some three miles in circumference and covering a hundred acres. The Spaniards had come upon it soon after Columbus' discovery of Trinidad in 1498, and put it to use in caulking ships. By Gesner's time there was a desultory trade in Trinidad bitumen, chiefly for waterproofing and caulking purposes. From a ship calling at some Nova Scotia port, Gesner must have obtained a quantity of Trinidad pitch, for he tells us, in a book he wrote in 1860, that "it was from this bitumen that the author first obtained kerosene." [14] This oil was not entirely satisfactory, for it had an offensive odor; and there were the additional disadvantages that the raw material was difficult to come by [15] and yielded only 42 gallons of oil per ton. With all these drawbacks, Gesner probably would have discontinued his lamp oil experimentation had it not been for a fortunate discovery of suitable raw material locally.

Near Hillsborough, on the Petitcodiac River in Albert County, New Brunswick, a vein of peculiar black mineral had been discovered recently. When heated to high temperatures in a closed

[12] Abraham Gesner, M.D., *A Practical Treatise on Coal, Petroleum and other Distilled Oils* (New York, 1861), p. 74.

[13] Gesner, *op. cit.*, pp. 26–27.

[14] *Ibid.*

[15] It tended to melt and consolidate in a ship's hold "in such a manner as to require mining before it can be discharged." (*Ibid.*) Naturally ship captains were loath to carry such a cargo.

retort, it would yield a satisfactory burning oil. The mineral was black, would burn, and superficially resembled coal. Its similarities to coal, Gesner correctly observed, ended there. It had, he said, "all the essential properties of asphaltum, while it is void of those that constitute true coal." From this "Albert mineral," Gesner made an illuminating oil which he demonstrated, burning it in lamps, at public lectures on Prince Edward Island, in August 1846, and later at Halifax.[16]

Dr. Gesner was not in all probability sufficiently impressed with this oil to feel impelled to proceed at once with its manufacture on a commercial scale. At least he did not, but devoted his spare-time energies to other affairs. In 1847, he accepted appointment from the provincial government of Nova Scotia as Commissioner to the Indians,[17] and the same year brought out in London, *New Brunswick with Notes for Immigrants*, a 388-page guidebook. It must have had a fair degree of success, for he followed it with *The Industrial Resources of Nova Scotia*, 341 pages, published at Halifax in 1849. "Col. Henry," Dr. Gesner's father, passed away at the age of 94 on 13 October 1850; shortly afterward, the doctor moved his family to Sackville, a small community near Halifax, and in 1852, into the city of Halifax.[18]

It was while he was living in and near Halifax that Gesner became acquainted with Thomas Cochrane, 10th Earl of Dundonald, Admiral of the British North America and West India Station, who, in addition to a career as one of the most improbable heroes [19] of

[16] Gesner, *op. cit.*, pp. 8–9.
[17] Matthew, *loc. cit.*, p. 48.
[18] G. W. Gesner, *loc. cit.*
[19] Dundonald (1775–1860) is a hero that Kenneth Roberts has overlooked. His dashing bravery gained him command of a war vessel by 25; his fame, election to parliament; his continued gallantry was rewarded by the Order of the Bath (1809), and command of the British flagship for the coast of America (1813). Financial speculations upon the London Stock Exchange (1814) brought him disgrace, court martial, separation from the service, fine and imprisonment. He led a filibuster's life from 1817–32, commanding the Chilean Navy during that country's successful revolt against Spain, heading the Brazilian fleet, and finally serving with the Greek Navy during their wars against the Turks, distinguishing himself always by feats of signal daring. Lord Byron, another veteran of the Greek campaign, is supposed to have patterned his "Don Juan" on Dundonald. In 1832, Dundonald was vindicated and restored to the British Navy and later (1847) to his former place in the Order of the Bath. From 1848 to 1851, he commanded the British Navy in North America and the West Indies. He died on 30 Oct. 1860 in his 85th year, and was buried in Westminster Abbey — "after a thousand hairbreadth escapes from death on sea and land, lived long beyond the common age of man." See his *Autobiography of a Seaman* (London, 2 vols., 1860–61); *The Life of Thomas, Lord Cochrane, 10th Earl of Dundonald, G.C.B.*, by Thomas, 11th Earl of Dun-

fact or fiction, was interested throughout his long life in the practical application of the applied sciences, particularly in matters relating to asphalt and bituminous substances. His father before him had, in 1781, patented a method [20] of distilling coal tar to obtain an illuminating oil, a waterproofing agent and other useful products, and had lost the very substantial family fortune in schemes for the commercial development of this and others of his inventions. From the moment he first saw the Trinidad Pitch Lake, Dundonald had begun hatching schemes for applying this asphaltic material to paving, the construction of water mains, and the insulation of electric wires.

During his three-year stay as British Admiral in America, Dundonald made his headquarters in Halifax. It is easy to imagine the delight he and Gesner, although a generation apart in age, must have taken in each other's company. Both men had an abiding interest in the practical application of the natural sciences, and both were just then giving a great deal of specific thought to the uses that could be found for the bitumen of Trinidad. Both Gesner and Dundonald were highly hopeful individuals; we do not wonder that their random conversations led, as they did, to concrete proposals for the organization of a company to exploit not only the Trinidad bitumen but the similar deposit which had been found not long before in Albert County, N.B.

Dundonald was then in his seventy-fifth year. In April, 1851, his term of service expired and he returned the next month to England. Whether he and Gesner continued to further their project of a company by transatlantic correspondence, we do not know. We do know that during 1851–1853 Dundonald filed in England a series of comprehensive patents covering in the broadest terms the applications of natural asphalt.[21] These patents were confined chiefly to the use of asphalt as a paving material, as a mastic, as a "hydraulic concrete" suitable for fashioning into water pipes and sewer mains, and as an insulating material for electric wires. For some reason,

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donald and H. R. Foxbourne (London, 2 vols., 1869); and obituary in *Scientific American*, 24 Nov. 1860, which is source of quotation in previous sentence. Fate played a dirty trick on Dundonald's memory. E. A. Sothern, the actor, had known him in Halifax and from this acquaintance created his famous character, Lord Dundreary in *Our American Cousin*. The role was considerably embellished over the years and became for American audiences the embodiment of the titled British fop. Sothern and his son, E. H. Sothern, played Dundreary with great success for more than a half century. (Mark Sullivan, *Our Times* [New York, 1930], III, 562–3).

[20] British patent No. 1291 (1781).

[21] *Life* by his son, II, 307 ff.

either because of his father's unsatisfactory experiences or because his new friend Gesner had already attended to this end of the business, Dundonald did not seem particularly concerned with the possibilities of an illuminating oil made from these natural asphalts.

To help guarantee the success of their proposed company, Dundonald and Gesner attempted to obtain control of actual deposits of bitumen. Dundonald had by 1851 assured himself control of the Pitch Lake at Trinidad by buying all the land surrounding it. A survey map dated 24 February 1851 shows Dundonald as the proprietor of the entire circumference of the Pitch Lake.[22]

For his part, it was not so easy for Gesner to obtain control of the Albert County mineral. Coal-mining rights on this land had been reserved to the Crown in the land grants. In April, 1852, Gesner brought action in the court at Halifax to show that this Albert County mineral was asphaltum and not coal, and therefore not subject to these legal restrictions. The Halifax court sustained his contention.[23] However, most of these lands in Albert County had already been leased for coal-mining purposes by William Cairns, who claimed that the mineral was coal, and refused to recognize Gesner's claim for mining asphalt. This led to a trial in the Albert County courts in July, 1852. The jury, instructed by the judge that Cairns' license to mine coal included "and other mines and minerals," was obliged to find against Gesner.[24] The result was that the mineral would for the next 30 years be known as "Albert coal" although later geologists have since repealed the court's error and endorsed Gesner's contention by naming it albertite, a generic term which embraces a whole class of asphaltic pyrobitumens.[25]

For many men, this setback would have meant the end of the enterprise rather than the beginning. Dr. Gesner does not, however, seem to have been discouraged. He probably had good reason to believe, whatever the decision of the court, that material very similar to Albert mineral could be had from other sources. Early in 1853, Gesner, then nearing his fifty-sixth birthday, packed up his

[22] Frontispiece of *Brief Extracts from the Memoranda of the Earl of Dundonald, on the Use, Properties, and Products of the Bitumen and Petroleum of Trinidad* (London, 1857), 14 pp. + 8 plates. Dundonald occupied the balance of his life with unsuccessful attempts to interest British investors in his patents and holdings in Trinidad.

[23] A. Gesner, *op. cit.*, p. 22.

[24] Gesner, *op. cit.*; Matthew, *loc. cit.*, p. 48; "Report of a Case Tried at Albert Circuit, 1852, by His Honor Judge Wilmot and a Special Jury. Abraham Gesner *vs.* William Cairns" (Saint John, 1853), p. 168.

[25] Herbert Abraham, *Asphalts and Allied Substances*, 5th ed. (New York, 1945), I, 293.

family and moved from Halifax to New York, there to get the new enterprise under way.

III

What kind of success he met with immediately we can only guess. In March, 1853, Horatio Eagle, young partner of Eagle & Hazard, ship's agents and brokers, of 40 South Street,[26] issued an eight-page circular entitled "Project for the Formation of a Company to Work the Combined Patent Rights (for the State of New York) of Dr. Abraham Gesner, of Halifax, N.S., and the Right Hon. The Earl of Dundonald, of Middlesex, England." [27] In his prospectus, Eagle set forth some of the articles that the new company proposed to manufacture:

> The *material* used (Asphalte Rock) is an entirely new article of commerce, and is found in inexhaustible quantities in the Province of New Brunswick. Arrangements are being made to insure to the company a full and constant supply of the Rock.
>
> The *process* of manufacture (chiefly by dry distillation), and the method of extracting the fluids is peculiar, but at the same time very simple, requiring but few hands and no complex machinery.
>
> Among the various *products* obtained, may be enumerated Mineral Naphtha, Hydraulic Concrete, Burning Fluids, Mineral Tar and Pitch, and Railway Grease; — the whole native material, in fact, being employed for some useful purpose.

The pamphlet then went on to outline (with technical detail that is surprising when one considers that petroleum products would not be used for these purposes for some years yet) the uses of "Mineral Naphtha" as a solvent for India rubber and gutta-percha; the use of petroleum asphalt as a paving material for all manner of walks, roads, pavements, floors and gutter linings; as a waterproofing agent for rendering porous materials such as brick and wood water-tight; as a coating to prevent metals from rusting; and as a perfect insulating agent for telegraph wires run underground. This material would, the prospectus said, make an ideal paint and varnish (as in-

[26] According to his obituary in the New York *Post*, 6 April 1875, Eagle would have been 28 years old in 1853 at the time he began promoting Gesner's company. Except for the years 1860–1862, when he is shown in the New York City directories as "gas apparatus and coal oils, 254 Canal Street," Eagle is listed as a ship's broker at various downtown addresses between 1848 and 1875.

[27] Pamphlet in Bella C. Landauer Collection, New-York Historical Society.

deed it has), a railway grease, and above all "burning fluids . . . which could be manufactured at a lower cost than the various burning fluids now most in use."

A ton of this "Asphalte Rock" from New Brunswick would make, according to an analysis which had been furnished by Dr. Gesner: 15 gallons of "Kerosine, or Burning Fluid," 15 gallons of "Mineral Naphtha," 5 gallons of railway grease, 880 pounds of "hydraulic concrete" (paving asphalt), 200 pounds of "Mineral Pitch" (semisolid asphalt suitable for paints and caulking), and undetermined amounts of paraffin, coke, gas ("used for lighting manufactory"), and ashes which, because of their ammonia content, were suitable for use as fertilizer.

Dr. Gesner estimated the value of one ton of this raw material at $5.00 [28] and the value of its products, as they came from the still, at $43. To acquaint the New York investor with Dr. Gesner, a brief biographical sketch was appended, occupying a page. At the end of the prospectus, Eagle set forth that "Dr. Gesner's services (it may be as well to observe) have been secured to the company for a term of years, at a moderate salary. It is now proposed to form a Joint Stock Company (for working under the combined patents), of one hundred thousand dollars capital, to be divided into one thousand shares of one hundred dollars each." Specimens of the products to be made were on display at Eagle's office, where stock subscriptions would also be received. Eagle signed the circular as "Assignee of Patentees."

The name tentatively selected for the new company was the Asphalt Mining and Kerosene Gas Company. It was to this company that Gesner's patents were assigned when they finally issued from the patent office on 27 June 1854.[29] The recital of the patents began "I, Abraham Gesner, late of the city and county of New York, now of Williamsburg, in the county of Kings, and State of New York, have invented and discovered a new and useful manufacture or composition of matter, being a new liquid hydrocarbon, which I denominate Kerosene, and which may be used for illuminating or other purposes . . . I obtain this product from petroleum, maltha, or soft mineral pitch, asphaltum, or bitumen wherever found, by

[28] But not for long. By 1858, Samuel Downer, Jr., of Boston, was paying "$20 gold per ton at the wharf in New Brunswick." (Merrill's reminiscences, p. 884.)

[29] U.S. Patents Nos. 11,203, 11,204, and 11,205, for "Improvements in Kerosene Burning Fluids."

dry distillation and subsequent treatment with powerful reagents and redistillation."

Gesner then went on to describe the physical properties of the Kerosene, which he divided into three fractions: Kerosene "A," Kerosene "B," and Kerosene "C," one patent for each Kerosene. Kerosenes "A" and "B," from the descriptions he gives of them (weight, boiling point, inflammability) can be identified as the light and heavy fractions of what we today call gasoline.

Kerosene "C" offered the best commercial possibilities. "It is not very volatile or inflammable," Gesner wrote in his patent, "but in an Argand lamp, with a button over the wick, it burns with a brilliant white light without smoke or the naphthalous odor so offensive in many hydrocarbons having some resemblance to this but possessing very different properties." It was also "very good as a lubricant for machinery where it has been tried."

The balance of the patent was given over to a careful description of the distilling and treating process. After the liquid had been obtained by dry distillation in a closed retort, it had to be treated to remove undesirable impurities. This, Gesner accomplished by mixing it thoroughly with sulphuric acid, 5 per cent to 10 per cent the volume of the oil being treated, to remove any tars present. The purified oil was then washed with freshly calcined lime, about 2 per cent by volume, to absorb any water present and neutralize the effect of the acid. Following this treatment, the oil was redistilled. As a result of this careful processing, Gesner was able, as he pointed out in his patent, to refine an oil of superior burning qualities. It did not smoke, it burned without an odor, and with a good deal more brilliance than anything which had yet come to the market. His patent was well-drawn, covered the process and not merely the apparatus, and also included, for purposes of protecting it, the trade name which had been chosen — Kerosene.

We are fortunate to have uncovered a first-hand account by one of Dr. Gesner's relatives who was present at the christening of the new product. He tells us: "The writer, a near relative of the patentee, recalls the debate upon the name to be given to the new illuminating oil, and the reason why 'Kerosene' was decided upon. Paraffine, which occurred in the manufacture, has a waxy appearance, and was formerly called tar-wax and it was suggested that Greek words which signified 'wax-oil' might form a proper name. Therefore, *Keros*, wax, and *elain*, oil, were chosen. At that time, camphene, a compound of alcohol and spirits of turpentine, was in use as an illuminator, and it was decided to adopt its termination,

the public being familiar with it, and accordingly *Kerosene*, instead of *Keroselain*, was decided upon." [30]

By the time Dr. Gesner's patents were granted in June, 1854, the establishment of a works to make Kerosene, in accordance with the methods he had described, was already under way.

IV

Until such time as the incorporation papers, account books, and correspondence of this enterprise turn up (an event which now seems highly unlikely), we shall not be able to say with certainty just who the incorporators of this first Kerosene company were, how much money they furnished to get it started or, indeed, exactly when the works began operation. From land records in the Queens County Register's Office at Jamaica, we learn that on 17 April 1854, Horatio Eagle, merchant, Erastus W. Smith, engineer, and Philo T. Ruggles, lawyer, all of New York, purchased from Neziah Bliss and Samuel Sneden of Greenpoint, a seven-acre tract on the east bank of Newtown Creek, in Queens County, for $17,500.[31] Bliss and Sneden had only recently purchased the land from farmer George Kowenhoven and were busily laying out the development which they had named Blissville. The lots purchased for the site of the new plant were some 800 feet in depth with 327 feet of frontage on the navigable waters of Newtown Creek.

The new company was apparently then in the process of organization. Eagle, Smith, and Ruggles each held a third of the tract in their own names from 17 April until 1 May 1854, at which time they deeded the site, for the same price as they had paid, to the North American Kerosene Gas Light Company. Philo T. Ruggles (1803–1894) was a brother of the rich and famous Samuel B. Ruggles, the man who developed Gramercy Park. Though less well-

[30] This account, probably by G. W. or John Frederick Gesner, appeared in the *Engineering and Mining Journal*, 9 Feb. 1884, pp. 99–100. It is interesting etymologically because it explains the origin of the *-ene* ending, hitherto a mystery. Uncertainty over the origin of this termination (Dr. Gesner, *op. cit.*, p. 9, "explained" the word merely by announcing that it was derived "from κηρός, wax, and ἔλαιον, oil") led to numerous misspellings, the chief of which, *kerosine*, was "officially" adopted a few years ago by the standardization committees of the American Society for Testing Materials and the British Institute of Petroleum. This needless spelling alteration, which is without historical validity, has fortunately made little headway; both the Merriam-Webster and Oxford dictionaries continue to recognize only the original spelling, *kerosene*.

[31] Deed, Bliss and Sneden to Eagle, Queens County Land Records, Liber 128, p. 263; Eagle to North American Kerosene Gas Light Co., p. 346; Smith to Kerosene Co., p. 344; Ruggles to Kerosene Co., p. 341.

known to posterity, Philo Ruggles was a prominent New York lawyer of his day, well-to-do in his own right, and was, at 51, in the prime of life.[32] It is reasonable to assume that his interest and activity played an important part in enlisting financial support for the new North American Kerosene Gas Light Company.

The plan to include Dundonald's patents seems to have been dropped at this time, for no attempt was made to file Dundonald's British patents in the United States, and we encounter no further mention of Dundonald among the people in Gesner's circle. The new Kerosene Works on Newtown Creek was quite enough to keep Dr. Gesner and his friends fully occupied for the next several months. Gesner designed the buildings and equipment; Stillman & Allen, doing business as the Novelty Iron Works, foot of 12th Street and East River, fabricated the distilling apparatus to his specifications; the chemicals used to treat the product were supplied by Martin Kalbfleisch, of Bushwick; and the raw material was a cannel coal very similar to the Albert County mineral, from Dorchester, Westmoreland County, New Brunswick, across the bay from Albert County.[33]

From engineers' drawings of the plant which have survived,[34] we can appreciate Dr. Gesner's very real abilities as a practical manufacturing chemist. His plant was laid out in orderly fashion and the individual pieces of equipment, shown in detail drawings, were well planned and well constructed, differing very little from similar pieces of refinery equipment being built as late as the time of the First World War. For all his self-education, Gesner was far better grounded in the theoretical aspects of his business than were the long stream of "practical" refiners who would follow him and dominate the American oil refining business for the next half century.

One might anticipate that the new oil works would encounter technical difficulties in the initial months of operation. Dr. Gesner's son, George W., who was associated with him in the venture, tells us that this was, indeed, the case.[35] We hear very little of the Kerosene Works during the next 12 months, although we can be fairly

[32] Henry Stoddard Ruggles, *The Ruggles Family of England and America*, 3rd ed. (New York, 1896), pp. 150–1; Henry W. Lanier, *A Century of Banking in New York, 1822–1922* (New York, 1922), p. 277, shows Philo Ruggles as one of the incorporators in 1822 of a predecessor of the present National City Bank of New York.

[33] *Engineering and Mining Journal*, 9 Feb. 1884, p. 99.

[34] Drawings in Gesner's *Practical Treatise* (1861) are without doubt those of buildings and equipment at the Kerosene Works.

[35] G. W. Gesner, *loc. cit.*, p. 8; *Engineering and Mining Journal, loc. cit.*

sure that it began operations in the first half of 1854.[36] A large panoramic view of New York and Brooklyn, published as a supplement to the *Illustrated London News* for 24 November 1855, shows Newtown Creek in the far background, and dimly visible on the Queens bank of the creek are the quite impressive set of buildings of the new Kerosene Oil Works.

By early 1856 at least, the new company was issuing advertising circulars heralding the superior virtue of its product. One of these circular letters[37] tells of extensive tests run in February, 1856, by independent chemists (the "scientific" advertising approach has changed little in a hundred years!) of all the main illuminants then sold in trade: Kerosene, Camphene, Sylvic Oil (a patent rosin oil), rapeseed oil, whale oil, lard oil, sperm oil, and "burning fluid." Kerosene, according to one of these examinations, produced a light 13 times brighter than Sylvic, Lard, and Whale Oils; 6 times as bright as sperm oil; 2¼ times as bright as Camphene or rapeseed oil; 26 times as bright as "burning fluid"; and 4 times as bright as even that paragon of the age, the gas light.

An even more telling argument against the other illuminants was expense. Kerosene was then priced at $1.00 a gallon. Camphene ($.63), Sylvic oil ($.50), and "burning fluid" ($.87) were cheaper; the others (except for the oil of the right whale, priced at a dollar) were more expensive: lard oil was $1.25 a gallon, rapeseed oil, $1.50, and sperm oil, $2.25 a gallon. When these figures were reduced to an absolute "cost of an equal amount of light," the economy of Kerosene was impressive. To produce an equal amount of light with the lowly "burning fluid" cost more than seven times as much; with sperm oil, six times as much, with lard oil, four times as much; and so on down the scale. Even gas light was nearly double Kerosene in cost.[38]

"In fact," the pamphlet concluded triumphantly, in an advertising claim destined to prove true, "no material has hitherto been offered to the public capable of producing such a light as Kerosene oil. It gives a better and more brilliant light than any other substance known, at less than one-half the cost of candles or camphene, . . . is extremely cleanly, gives no odor, will not congeal in any climate,

[36] Abraham Gesner, M.D., *A Practical Treatise on Coal, Petroleum and Other Distilled Oils*, 2nd ed., Revised and Enlarged by George Weltden Gesner (New York, 1865), p. 10; New York *Commercial Advertiser*, 24 Aug. 1859.

[37] Circular letter, "Kerosene Oils, Distilled from Coals. Not Explosive — Secured by Letters Patent," in Bella C. Landauer Collection, New-York Historical Society.

[38] Gesner, *op. cit.*, p. 2.

and is perfectly safe in any hands. . . . In consequence of the economy and safety of its use, and brilliancy of the light which it emits, [it] must soon be used in every house in the country." [39]

Kerosene, although this may seem strange to us, also found a ready acceptance as a lubricating oil. Such a use for it was, really, not at all unusual, for the other commonly sold illuminants of the day, such as lard oil and whale oil, were normally used to lubricate all sorts of machinery. This early Kerosene circular contains two pages of testimonials from ships' engineers and newspaper pressmen who had words of high praise for Kerosene's properties as a lubricator. The company's New Orleans agents, B. Nautre & Co. (a connection established, no doubt, through Eagle who was ship's agent for New Orleans lines), seem to have been especially zealous in introducing the new oil to newspaper offices.[40]

Following general practice of the time, the Kerosene Works placed its sales in the hands of a firm of selling agents rather than attempt to manage a sales force of its own. General sales agents for the new Kerosene Works were the brothers John H. and George W. Austen, who maintained a sales office at 50 Beaver Street, near Delmonico's corner. The Austen brothers, sons of a well-known New York merchant,[41] were energetic in pushing Kerosene and contributed probably more than any other persons to the new company's commercial success. It was John Austen who introduced an inexpensive lamp for burning the new oil. Kerosene would, as Dr. Gesner had noted in his patent, burn well in an Argand lamp; but the Argand lamp, which had a tall glass chimney and a circular wick, like that of a present-day oil stove, was complicated, expensive, and confined to the well-to-do households able to afford sperm oil. Austen supplied the lack of a satisfactory inexpensive lamp by im-

[39] Gesner, *op. cit.*, p. 1.

[40] Gesner, *op. cit.*, pp. 3–4.

[41] Prior to their entry into the Kerosene business, the Austen brothers had been associated with their father, David Austen, in the well-known auctioneering firm of Austen, Spicer & Co. The elder Austen had accumulated a large fortune in the days when almost all of New York's wholesale mercantile trade was handled by auction, but he and his sons had been wiped out by the failure of their firm in 1851, the result of too-liberal credit advances. Because of this recent failure, it is unlikely that the Austens had any surplus funds to invest in the Kerosene company at its start. See *Wealth and Biography of the Wealthy Citizens of New York City*, 6th ed. (New York, 1845), p. 3, which puts David Austen's worth at that time at $400,000. Location of the sons' firm is given in *Engineering and Mining Journal*, *loc. cit.*, and New York City *Directory*, 1856–1857; biographical material in Walter Barrett, *The Old Merchants of New York City* (New York, 1885), I, 115; III, 176.

porting from Vienna [42] a cheap, flat-wick lamp with glass chimney. In it, Kerosene burned cleanly and completely, without smoke or smell. This "Vienna burner," put upon the market as the "Kerosene lamp" by the Austens and their agents, was widely copied. In the ensuing decade, the U.S. Patent Office granted literally hundreds of patents for "improvements" in the design of the Vienna burner; but its fundamental features, a flat wick and glass chimney, have never been improved.

This rash of activity in the lamp field is indicative of the success the new oils met once they began to catch on. Horatio Eagle's original prospectus of March, 1853, had confidently predicted the new illuminant would win out over all others; but one must not suppose that this victory was cheap or easy. A relative of Gesner recalled, "The new illuminating oil met with the strongest opposition from the turpentine and alcohol trades. Its odor, which was not then so well removed as it was later on, gave those interested a weapon against its introduction, which at times seemed likely to be wielded fatally. After a time, however, its soft, steady light and perfect safety, in contrast with the poor light and fiery rays of camphene, gained it friends and enabled its manufacturers to make headway against all opposition." [43]

V

But by this time (1856–1857), competitors were making their way upon the scene. The two of greatest size and interest were the plants of James Young at Bathgate, in Scotland, and of Samuel Downer, Jr., at South Boston. Both enterprises started out to manufacture lubricants, a class of materials for which there was urgent demand a century ago. The lubricants available in 1850 were natural oils like castor oil, or animal oils such as whale oil and lard.

[42] G. W. Gesner (in his 1865 revision of his father's *Practical Treatise*, p. 11), the author of the *Engineering and Mining Journal* article, and Joshua Merrill, a competitor (Merrill's reminiscences, p. 883) all agree it was Austen who brought the flat-wick burner from Vienna. It is probable that petroleum illuminating oils in Europe, antedating those of America, were produced in the old Austro-Hungarian Empire, using oil from petroleum springs of Galicia. Sir Boverton Redwood, *A Treatise on Petroleum*, 4th ed. (London, 1922), I, 20, says that by 1853, a petroleum oil was used to light the station of the Emperor Ferdinand's North Railway, and that in 1854, petroleum illuminants gained a footing in Vienna as an article of commerce. This statement is corroborated by Austen's discovery of a suitable lamp, already developed in Vienna. Young's first production of illuminating oil in 1856 was shipped chiefly to Vienna (Bailey, see citation 44, below).

[43] *Engineering and Mining Journal, loc. cit.*

On slow-moving machinery they had been serviceable enough, but in the new high-speed steam-powered machinery such as power looms and steam printing presses, the heat of friction quickly broke down natural oils. Manufacturers (and railroads, too, for they had many of the same problems) were willing to try any lubricant and to pay fancy prices for ones that would work. In response to this demand, the hands of innumerable practical chemists were turned, in the years between 1845 and 1860, to the problem of producing artificial lubricants which would stand up better than natural oils. Most of the numerous patents for distilling or treating hydrocarbon substances taken out in England and America during these years (there were 12 in England in 1853 alone), were for the purpose of manufacturing lubricating oil, for it promised the largest financial rewards.

One of the patentees was James Young (1811–1883), an alert young Scotch chemist working in England who, in December, 1847, had had his attention called to a petroleum "spring" producing about 300 gallons a day of crude oil in a coal mine at Riddings in Derbyshire.[44] In September, 1848, Young and the mine owners organized a partnership to manufacture lubricants and industrial naphthas for use as solvents. Young theorized (incorrectly) that the crude oil had been formed by the effect of subterranean heat upon the coal deposit. This supposed reaction he set about reproducing in a laboratory in the hope that he could increase the small supply of crude oil available.

"I started an investigation," he later wrote, "with the prospect of procuring petroleum, or [a] substance equivalent to it, from coal and after some time succeeded. . . . The process consists in the distillation of coal at the lowest temperature at which it can be decomposed. By this process we obtain a mixture of several liquids with paraffin dissolved in them. This liquid I named paraffin oil." [45] In a British patent dated 17 October 1850 Young described his method; he filed the same patent in the United States and it was issued to him on 23 March 1852.

[44] The best material available on Young was compiled by Edwin M. Bailey, a member of the Scottish Branch of the Institute of Petroleum, who had access to all of Young's correspondence, diaries, and scrapbooks. This material, published as "James Young — Founder of the Mineral Oil Industry" (Institute of Petroleum *Review*, London, 1948, II, 180–3, 216–21, and 249–52) and "The Dawn of Petroleum Refining," (I. P. *Review*, II, 357–60), has not previously been noticed by scholars writing on Young in this country. The author is indebted for photostatic copies of these articles to Prof. R. J. Forbes, of Amsterdam.

[45] Bailey, *loc. cit.*, p. 359.

In 1850–1851, Young moved to Bathgate, West Lothian, Scotland, to be near Torbane Hill, which contained a cannel coal rich in oil. Here, he and his partners, E. W. Binney and James Meldrum, built a large new "Paraffin Oil" works. E. M. Bailey, who wrote a careful account of Young's early work a few years ago from Young's own correspondence and diaries, tells us that the Bathgate works "at first manufactured naphtha and lubricating oil. Paraffin oil for burning and solid paraffin were not sold until 1856, and the demand for it only became considerable in 1859." [46]

This account ties in well with the recollections of Joshua Merrill, for many years superintendent of the Downer works in Boston. Samuel Downer, Jr., had been in the whale oil business in Boston for more than 20 years, building up an oil distributing and candle manufacturing business that was "one of the largest and most prosperous in the trade." [47] Early in the 1850's, Dr. Samuel R. Philbrick [48] and the brothers Luther and William Atwood, manufacturing pharmaceutical chemists of Boston, had become interested in products that could be made by distilling the coal tar left over from the operation of gas works.[49] During 1852, Luther Atwood, the best chemist of the three, succeeded in distilling from coal tar an oil which was, he felt, suitable for lubricating machinery. He christened it "Coup-Oil" in honor of Louis Napoleon's recent *coup d'état*, and applied for a patent which was issued 29 March 1853.[50]

To manufacture their "Coup-Oil," Dr. Philbrick and the Atwoods organized the United States Chemical Manufacturing Co., with a plant at Waltham, Massachusetts. The business prospered indifferently; Downer was induced, about 1854, to buy an interest in it, and once in the company, discovered that its finances were in a sorry state. He paid up the company's debts and took over complete

[46] Young prospered because of his shrewd management and good patent position. He became wealthy, and a benefactor of scientific education and African missions. His best-known effort in the latter category was his financing of some of the expeditions of Dr. Livingstone. His firm, Young's Paraffin Light & Mineral Oil Co., Ltd., is still in existence, since 1919 a wholly owned subsidiary of Anglo-Iranian Oil Company.

[47] Merrill's account, *loc. cit.*, p. 890.

[48] Merrill gives the name as "Philbrook," no doubt a misprint, for it appears as "Philbrick" on a circular in the Landauer Collection.

[49] Merrill, *loc. cit.*, p. 880.

[50] This and other patents are listed and described by Thomas Antisell, M.D., *The Manufacture of Photogenic or Hydro-Carbon Oils* (New York, 1860), p. 141. Dr. Antisell was professor of chemistry in the medical department of Georgetown College, Washington, and U. S. Patent Office examiner in matters involving chemical processes.

ownership of it, laying out for the purpose some $102,000.[51] Downer retained Dr. Philbrick and the Atwoods in his employ, and they evolved a lubricating oil compounded of castor oil, "Coup-Oil," and animal fats. It had such a trenchant odor that 90 per cent of their customers could not be induced to order a second batch.[52] Downer appeared to be on the verge of losing his investment, when a call from an unexpected quarter completely altered the course of events.

Dr. Philbrick received a letter from Geo. Miller & Co., of Glasgow, saying they wished to install the "Coup-Oil" process. Downer promptly dispatched Luther Atwood to Scotland where he remained a year, building and installing the apparatus. The Miller concern were also large producers of coal-tar naphthas which they sold as a solvent for dissolving rubber then being used for making mackintosh waterproof goods for the Crimean War. The Miller people had such a large demand for this rubber solvent that they bought naphthas from other manufacturers, among them James Young's works. Atwood, an inveterate experimenter, took some of the naphtha from Young's works and by a little treatment made it into a water-white illuminating oil. Some of it was burning in a lamp in the Miller & Co. offices when Young happened in one day. Miller told him, "that is some of your brown Bathgate naphtha that our chemist has been manipulating and refining and this is a sample of the oil." According to Merrill, who witnessed the scene, Young discontinued the sale of his naphtha forthwith, and soon after began to manufacture and sell a paraffin illuminating oil.[53]

Atwood and Merrill returned to Boston in October, 1856, convinced that Downer should begin manufacture of a similar illuminating oil. During 1857, they arranged to obtain supplies of Albert Coal for $25 a ton delivered in Boston, and using it as raw material, got into full-scale manufacture of the new "coal oil." The Downer Works' business went slowly at first but by March of 1859, Downer had a warehouse full of customers' empty cans waiting to be filled with "coal oil" at $1.35 to $1.40 a gallon, and had made a profit, after completely paying off the cost of the plant, of more than $100,000.[54]

This mention of the chief competitors of the "Gesner Works" is for the purpose of showing that they began manufacture of coal-oil

[51] Merrill, *loc. cit.*, p. 890.
[52] *Ibid.*
[53] Gesner, *op. cit.*, p. 881. This ties in with Bailey's account. Bailey and Merrill agree on most matters of fact.
[54] Gesner, *op. cit.*, p. 884.

illuminants after the start of the Kerosene Works, not before, as several oil industry historians have stated.[55]

VI

Meanwhile, how was the Kerosene Works on Newtown Creek prospering? Pending discovery of actual corporate account books, we cannot say definitely, but there is every evidence that this pioneer plant prospered mightily. The Downer works in Boston, paying $25 a ton for its coals and having a daily capacity at the end of 1859 of 1,500 gallons,[56] had cleared by the end of that year, well over $100,000.[57] The Kerosene Company's plant on Newtown Creek had a capacity of 5,000 gallons a day by the end of 1859,[58] more than three times the volume of Downer's plant. The New York works had some years earlier given up the New Brunswick source of coal supply, and instead imported Boghead Coal, from Young's mine on Torbane Hill, in Bathgate. During 1859, the Kerosene Company brought in 20,000 tons of this material at an average cost of $18 a ton,[59] a full one-third less than Downer paid for his raw material. So with raw material costs a third less, and a gross throughput of more than three times the volume of the Downer plant, the Kerosene Company should have made a very handsome profit. It was in addition very favorably located as to markets, with the nation's largest consuming center in its own "front yard."

Some idea of the extent of the New York Kerosene Oil Company's [60] plant may be had from a descriptive article that appeared in the New York *Commercial Advertiser*, 24 August 1859, only three days before the completion of Drake's first oil well at Titusville.

> The land owned by this company is about fourteen acres, seven acres of which are covered with buildings and erections for the purpose of manufacturing. They have built a bulkhead four hundred and ninety feet long, at which the lighters can discharge their cargo of coal and receive the oil for

[55] Even such a scholarly work as Paul H. Giddens, *The Birth of the Oil Industry* (New York, 1938), p. 19, falls into the customary error of crediting Young with the manufacture of illuminating oil in 1847. This and similar misstatements appear in many oil histories and are a chief reason why Gesner's pioneer role has not been more fully appreciated.

[56] *Hunt's Merchants' Magazine and Commercial Review*, Vol. 42 (New York, 1860), 245–6.

[57] Merrill, *loc. cit.*, p. 884.

[58] New York *Commercial Advertiser*, 24 Aug. 1859.

[59] Gesner, *Practical Treatise* (1861), pp. 20–21.

[60] The Kerosene Works were being called by the simpler name, New York Kerosene Oil Co., early in 1859, although Gesner's 1861 book still refers to the company as the North American Kerosene Gas Light Co.

shipment. The Flushing Railroad passes through their grounds. Between the railroad track and the creek are placed the "pipes," where the oil is extracted from the coal.

Following a detailed description of the distillation process and the underground oil storage facilities, the article continued:

On the grounds back of the railroad are several buildings, where the oil undergoes a process of purification and distillation to purify it and fit it for market. It is then pure white in color, and free from smell or oily feeling. One of these buildings contains thirteen stills. Another building is being constructed, and will be finished by the first of October, one hundred feet by fifty, to contain eight finishing stills. Still another building, now nearly finished, which is one hundred feet square, and divided into nine rooms, will contain a large number of stills; also two six thousand gallon tanks from which the oil will be drawn off, and barrelled ready for shipment. Other buildings near these are each used for the purpose of purifying the oil.

A large engine house, twenty by fifty feet, and two stories in height, has recently been erected. . . . Attached to this building is a large boiler room with a chimney one hundred and thirty feet high; here are placed two steam boilers forty-two inches in diameter and sixty feet long. Each of these buildings are fireproof and covered with slate. Two large iron cisterns are being built for this part of the grounds, capable of containing thirty-five thousand gallons each. The company are also about constructing a rail track from this part of the grounds to the docks to facilitate the carrying of oil from the refineries to the lighters. The track will be eight hundred feet long.

These works are more extensive than any in this country. The company use thirty thousand tons of coal per annum; this is unloaded at Greenpoint into canal boats and lighters and thence conveyed by means of the Newtown Creek to the dock. The amount of oil manufactured will average five thousand gallons a day for three hundred days in the year. The oil is sold for about one dollar and fifteen cents per gallon. About twelve thousand tons of coal are now on storage on the premises. There are about two hundred men constantly employed in the factories. About twenty-five men find constant employment in erecting buildings and putting up machinery. A coopers' shop is on the premises, where barrels are made and repaired. About one and a quarter millions of dollars are invested in the manufacture.

In conclusion, the *Commercial Advertiser's* reporter detailed the salable products then being manufactured, in addition to by-product gas which was flared because it was "at too great a distance from the city" for profitable sale. These products were Kerosene; "another quality of oil called 'binnacle oil' manufactured for ships' use"; paraffin, which "makes a candle much superior to the spermaceti"; a naphtha called Kerosoline "used for extracting grease from silk, woolen or other fabrics"; and "a superior lubricating oil."

So obvious indeed was the success of these two pioneer firms, the Kerosene Works in New York and Downer in Boston, that a multi-

tude of imitators sprang up during 1858 and 1859.[61] These new oil works were generally staffed by men of little or no experience in oil distilling with the result that the oils they made were inferior in burning qualities and often (through the ignorant inclusion of the fractions we now call gasoline) downright dangerous. The term "coal oil" became an undependable buying guide. Downer, who felt this state of affairs the most, early in 1859 arranged with the Kerosene Co. to be allowed to license their product name, and to incorporate the word in the name of his works at Boston and his new plant at Portland. A trade-mark warning circular dated 28 March 1859 was published advising customers that Kerosene was the registered trade-mark of the New York, Boston, and Portland plants, and that oils made by others must not be called Kerosene.[62]

It would be pleasant to record that Dr. Gesner made a comfortable fortune from the venture which was the child of his brain. This was not, however, the case. Unlike his competitors Young and Downer, Gesner was not a sole proprietor. From the outset he had been the company's salaried chemist; the probability is that he was also given a stock interest in exchange for his patent contributions, but we do not know for sure. Some time between 1856 and 1859, Luther Atwood[63] replaced him as chief chemist of the Kerosene Co. Gesner's patents did not hold up in the courts because of Young's prior filing, and the Kerosene Works, along with Downer and other coal-oil manufacturers, was obliged to take a license and pay royalties to Young.

There was no disputing that it had been Gesner's energy, vision, and enthusiasm that had brought the Kerosene Works into being. But having presided over the birth of the new enterprise and seen it safely through its childhood diseases, he moved on, just as he did in the case of his human patients, to concern himself with other

[61] *Hunt's, loc. cit.*, lists as of 31 Dec. 1859, 33 coal oil works with a daily manufacturing capacity of 18,750 gallons and an unnamed number of other plants with an additional 4,000 gallons a day capacity; "two years ago," the magazine says, "there were only two or three oil-works in the country." Dr. Gesner (*Practical Treatise* [1861], pp. 128–9) lists by name 56 coal-oil plants in operation a year later, 11 of them in the New York area. In addition, 16 new establishments worked petroleum only. Oldest of these was the one-barrel still of Samuel Kier in Pittsburgh, from which Col. A. C. Ferris, of 201 Pearl Street, corner Maiden Lane, had obtained and treated since 1857 a petroleum distillate which he called "Carbon Oil." By the end of 1859, according to *Hunt's*, Carbon Oil production was still insignificant, less than 300 gallons a day. Ferris sold 28 gallons of crude petroleum, obtained from seepages, to the Kerosene Works during March and April, 1858 (*The Derrick's Handbook*, I, 14).

[62] Landauer Collection, New-York Historical Society.

[63] *Commercial Advertiser* and Merrill accounts.

affairs. The city directories of New York and Brooklyn during the late 1850's and early 1860's show him practicing medicine from his home at 16 Bedford Avenue, Brooklyn, and also from an office at 24 William Street, New York. Three of his sons, Brower (1834–1874), John Frederick (1839–1899), and George Weltden (1829–1904), inherited their father's scientific interests and pursued the careers of geologists, mineralogists, chemists, and inventors.[64] The city directory for 1859 shows George W. and Brower in the business of "oils," at 58 Cortlandt Street; and 1860–1861, Geo. W. and Henry as chemists at 24 William Street.

With new coal-oil works being built monthly during 1858–1859, the demand for technical advice was very brisk. Few except the Gesners were competent to supply it. In 1860, Dr. Gesner, reverting to his old role of author, sat down and composed an exhaustive, well-written, extremely lucid guidebook for these refiners, *A Practical Treatise on Coal, Petroleum and Other Distilled Oils*, published early in 1861 by Baillière Brothers of 440 Broadway. This book, 134 pages with illustrations, is remarkable for the sound scientific knowledge the author displayed and for the accuracy of his predictions on the future course the refining business would take. If he had done nothing else, Gesner's *Practical Treatise* would entitle him to a major niche in the early history of petroleum technology. He correctly foresaw that coal-oil refiners must utilize their by-products, if they were to meet the competition of the illuminating oils made from the new petroleum coming from Pennsylvania. He urged in his book that coal-oil refiners use their tar residues to make tar-paper roofing and combine their ammonia water (a by-product) with their waste sulphuric acid to make ammonium sulphate for fertilizer – suggestions which, unfortunately for the future of the coal-oil business, no one saw fit to heed.

To the new business, Dr. Gesner had contributed much, but he was too wise and too well-read to indulge in exaggerated claims. "The progress of discovery," he wrote modestly, "in this case, as in others, has been slow and gradual. It has been carried on by the labors, not of one mind, but of many, so as to render it difficult to discover to whom the greatest credit is due."[65] This was, as it were, his valedictory. Dr. Gesner returned to his native Nova Scotia in 1863, and settled in Halifax, where he was offered the chair of natural history at Dalhousie, but before he could take up these duties, he died, on 29 April 1864, in his sixty-seventh year.

[64] A. Gesner, *op. cit.*
[65] Gesner, *Practical Treatise* (1861), p. 11.

The refining industry he had helped found lived on. The textbook which he had written for it (his son G. W. Gesner brought out a revision in 1865) was sold all over the world, translated into foreign languages and "adapted" by other authors for years to come. The coal-oil refineries, where they were reasonably well-managed, survived the change-over from coal to crude petroleum. The Kerosene Works on Newtown Creek became successively the New-York Kerosene Oil Company, Cozzens & Co., managers, 1863; [66] Queens County Oil Works, R. W. Burke, Agent, 1869–1870; and finally in July, 1876, when the "Best Kerosene Oil" was being advertised at $.16 a gallon,[67] the pioneer Kerosene plant passed quietly into the possession of Chas. Pratt & Co., a subsidiary of the growing Standard Oil Company.[68] Long before this, Dr. Gesner's "Kerosene" had ceased to be a proper noun and passed into the language where it still serves to perpetuate the memory of the hopeful man who with his new illuminant had helped make possible a "long and lasting holiday . . . for . . . the finny monsters of the sea." [69]

[66] There is a tradition, and some indications to support it, that the original Kerosene Co. failed in the early 1860's in the face of competition from the illuminants made from crude petroleum. *The Derrick's Handbook*, I, 14, mentions such a failure and names "Charles Delmonico, of New York restaurant fame" as one of the heavy losers. This account cannot be taken as conclusive evidence, for it is full of gross inaccuracies, including Delmonico's first name.

[67] Advertisement, Pratt's Astral Oil, Newtown *Register*, 6 July 1876, p. 1.

[68] As the Queens Works of Standard Oil Company of New York (now Socony-Vacuum Oil Co.), the plant operated until May, 1951. A junk dealer bought the refinery in 1952 and has since removed the equipment, although the buildings are still standing, including two that fit the description given in the *Commercial Advertiser*.

[69] Gesner, *Practical Treatise* (1861), p. 32.

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By Mabel Newcomer
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Professionalization of Leadership in the Big Business Corporation[1]

This study of the chief executives of large corporations over the period from 1900 to 1950 introduces specific evidence both to support and explain the thesis, hitherto vaguely entertained by many students of business, that administration of such corporations is rapidly becoming a profession.

Interest in the "professionalization of business management" has grown in recent years among both the sociologists and the economists. There is general agreement that such professionalization is developing rapidly, and the evidence usually presented is the growing number of chief executives of our larger corporations, at least, who are salaried managers trained for the job by long experience in the field, and perhaps also by formal schooling, in the art of management. This much is well established. But while there is an expanding literature on the appropriate training and qualifications of the business leader, few studies have been made of the actual training and qualifications of business executives, the extent to which professionalization can be said to have taken place, and the implications of such professionalization for the future conduct of business – and more particularly its implications for the control of big business.

This paper attempts to make some small contribution to our knowledge in this field. It presents part of the findings of a larger study I have made of the origins, training, and experience of the top executives in our large corporations, shortly to be published by the Columbia University Press.

The study is limited to the presidents and board chairmen of large nonfinancial corporations for three different business generations – 1900, 1925, and 1950. The test of size used is assets, and the study covers all nonfinancial corporations listed in *Moody's Manual*

[1] This paper was presented at the joint session of the Sheraton Group and the American Historical Association, New York, 28 Dec. 1954.

of Investments with assets in excess of $75 millions in 1950, $50 millions in 1925, and $25 millions in 1900. These amounts are roughly comparable in terms of the purchasing power of the dollar for the three periods. In addition, a sample of smaller corporations has been included for each period. These smaller corporations are, however, still large in absolute terms, the 1950 group having assets in excess of $50 millions. The number of corporations exceeds 200 in each of the earlier periods and is over 400 in 1950. The number of officers is more than 300 in each of the earlier periods and nearly 900 in 1950.

I am limiting myself here to discussion of (1) the tests of professionalization of top business management, (2) the extent to which professionalization appears to have taken place in the big nonfinancial corporations, as indicated by these tests, and (3) some of the implications of such professionalization.

The first test of professionalization is the extent and kind of formal education. The American tradition of "rags to riches" has assumed only the sketchiest kind of formal schooling; and the self-made businessman has often scorned a college education as a waste of time at best, and at worst a real handicap. One top executive, himself a Harvard graduate, comments that the Harvard student is "taught to 'get by' on his exam and then forget," and that after such training it is difficult, if not impossible, to teach him thoroughness and sustained effort. And another writes that when the college graduate enters the business world the first thing he has to learn is that "seventy per cent isn't passing."

The fact is, however, that big business not only tolerates the college man; a college degree is increasingly the ticket of admission to jobs with big corporations. It is true that the representatives of large business corporations who descend upon the college campuses every spring are looking for engineers and scientists, lawyers and accountants, and not for top administrators. But the fact remains that the great majority of chief executives are college men. Three-fourths of the 1950 executives of my study had some college education, and for those appointed after 1943 the proportion is four-fifths. Two-thirds of these recent appointees have a bachelor's degree, and one-fifth have pursued graduate study. Most of this latter group are engineers and lawyers – sometimes both – but they include a small number of Ph.D.s, M.D.s, and men with advanced degrees in business administration.

The proportion of big business executives with college training is estimated to be approximately 12 times the proportion found in the

entire male population of their age group. In view of the wide variation in the ages of these executives this comparison cannot be exact. For the entire male population I have used the proportion of males 18 to 21 years of age enrolled in college in 1910, the census year nearest that in which the median age of the 1950 executive group was 20.

The 76 per cent of 1950 executives with some college training is much higher than the 51 per cent found for the 1925 group and the 39 per cent found for the 1900 group; but even in these earlier generations the proportion of college men among the business executives is nearly 10 times that for the male population of their age groups. In other words, whether because of or in spite of a college education, a disproportionate number of college trained men are reaching the top executive position and have been doing so throughout this 50-year period.

When the *kind* of university education that the executives have had, or should have, is considered, generalizations are harder to make and defend. The actual educational experience of the 1950 executives is widely varied. Nineteen per cent of the 540 university graduates among the 1950 executives had law degrees, LL.B.s and J.D.s, and 32 per cent had first or advanced engineering degrees. These two professions combined account for just over half of all college graduates. Some of the remaining group majored in economics, accounting, and various business courses, but the proportion that had highly specialized training in this field appears to be small. The nature of their undergraduate courses in these fields usually cannot be identified by the kind of degree they earned, but the very fact that degrees in these subjects are not as regularly differentiated from the A.B. degree as those in law and engineering is in itself indicative of the fact that the training in business and economics is not as well defined or as specialized as that in law or engineering. Only 3.5 per cent of the 1950 business executives with college degrees had advanced degrees in business administration, as compared with 7.6 per cent with advanced degrees in engineering and 9.8 per cent with advanced degrees in law.

This should not be taken as evidence that professional training in law and engineering are more suitable for executives than professional training in business administration itself. The graduate schools of business administration are still too young to have turned out any large number of graduates among the age groups now in top positions in big business. Also, there is some evidence that within the official group from which the chief executives are likely

to be chosen there are more engineers and lawyers than professional business administrators. The corporations have turned to the universities and colleges for promising young engineers, lawyers, and scientists in the lower ranks. They have not sought promising young general administrators at that level. And when the time comes to choose a new president or board chairman, it is engineers and lawyers – not general administrators – who predominate among the vice presidents from whom the choice is most frequently made.

It seems probable that the graduate training in business administration as such is more suitable than graduate training in some other profession, although there is still greater diversity in the nature of this training than in that for the older professions. The consensus among the executives themselves and the authorities on administration is that specialized training, whether in law, engineering, or some science, is not as useful as a more general education. And while most do not appear to object to *advanced* training in business administration they stress the importance of a *general* education at the undergraduate level.

The best test of a suitable education for business administration is not the number of top executives who have been trained in the different fields, since the corporations have been relying on training on the job for their top executives rather than on their formal schooling. And as long as they require large numbers of engineers at the bottom for operations and production a disproportionate number of engineers are going to get the administrative experience which leads to the top.

The best test of a suitable education would appear to be, consequently, the relative success of top executives who have had different kinds of training. In an attempt to throw some light on this question a comparison has been made of the education of the top executives in rapidly growing corporations and corporations that have remained fairly static. All industrial corporations with assets in excess of $75 millions in 1950 were used for this comparison. The fast-growing corporations have been defined as those whose assets multiplied five times or more between 1925 and 1950. The "static" corporations are those whose assets actually declined or did not double during this period. Very few of this group had a large enough increase in assets to offset the increasing cost of replacement of assets. Change in asset values is not in itself an adequate test of success, but it is at least an objective measure which bears some relation to success. The officials of the corporations included in this study were the presidents and board chairmen who held

these offices for at least three years at some time between 1925 and 1950, and who should, in consequence, have had some responsibility for their companies' expansion or failure to expand. The number of officials is 119 for the fast-growing corporations, and 138 for the static corporations.

A slightly larger proportion of the officials of the fast-growing corporations had college degrees than was found for the officials of the static corporations – 51 per cent as compared with 48 per cent.[2] But the more striking difference lies in the proportion with specialized degrees – particularly in law. Only 6.8 per cent of the officials of the fast-growing corporations had law degrees as compared with 14.1 per cent of the officials of the static corporations. There were likewise more engineering degrees among the officials of the static corporations although the difference here is too small to be dependable. And whereas 30.5 per cent of the officials of the fast-growing group had relatively unspecialized bachelor's degrees, only 19.3 per cent of the officers of the static corporations had such unspecialized degrees. Such evidence as this comparison affords, then, appears to support the contention that the broader education is better. However, the relatively small number of cases and the limited value of the assets test suggest caution in accepting these differences as conclusive evidence of the superiority of a general education in this field.

While the debate continues as to the amount and kind of formal schooling that is desirable for training executives, it is training on the job that the corporations are really depending on. Increasingly top executives are chosen from the ranks of the companies' employees. For the 1900 group of executives 59 per cent had no previous history with the corporations, and only a fraction of these outsiders was selected for administrative success in other companies. For the 1950 executives, on the contrary, only 23 per cent had no previous history with the corporation, and most of the outsiders – 18 per cent of all officials – were selected for successful administration in other companies.

The change is due primarily, although not entirely, to the fact that the 1900 corporations were comparatively young. Only 29 per cent were as much as 20 years old at that time. Large numbers of them were still in the hands of their founders or the founders' heirs. Also, high office was something to be bought and sold in the stock

[2] The fact that the proportion for both groups is smaller than for the 1950 officials as a whole is due to the fact that this comparison included many older officials whose term of office ended before 1950.

market along with a controlling number of shares. But whatever the reason for the change, it is true today that the new corporation president is expected to have had many years of successful administrative experience, whether in his own corporation or elsewhere. His formal schooling may have contributed toward his success in the lower ranks, but it is too far behind him to be given much weight in the factors that lead to his final selection for top office.

Most of the authorities on qualifications for top administrators stress the importance of experience with general administration. They deplore the choice of specialists, whether the specialist be vice president of sales, the treasurer, or an engineer in charge of production. They favor the choice of men with experience as top executives of smaller companies, on the assumption that experience as a general administrator is more important than knowledge of the special problems of the individual corporation. The officials responsible for the selection of future presidents and board chairmen, on the contrary, tend to select from within – and therefore to select specialists. They recognize the need for breadth of training. But they attempt to meet this need, not by looking outside of their own organization but by selecting promising young officials from within and giving them special training. Some companies deliberately move these prospective top executives from department to department so that they will learn the business as a whole; others send them to the short training courses offered for executives by a number of universities; still others offer training programs of their own. But however the training is accomplished the fact that it is provided is recognition of the need for professional standards.

Another indication of increasing professionalization of business management is the almost universal acceptance of the principle that the job should be awarded on merit. The proportion of chief executives who inherited the office from other members of the family declined from 30 per cent to 15 per cent between 1900 and 1950 among those large business concerns old enough to be inherited – i.e., those more than 20 years old. And even the inheritors are expected to have given long and reasonably competent service. The growing dispersion of stock ownership makes it increasingly difficult for the heirs to enforce their claims, and the loyalty of the directors is more likely to be to the corporation and to the stockholders as a whole than to the founder's family. Substantial stock holdings may lead to a directorship but they give little if any claim to the presidency. This is not to say that favoritism plays no part in the final selection, or that the search for talent – whether inside or outside

the corporation – is always as extensive as might be expected in view of the importance of the job. But neither is the office awarded lightly. Some show of merit there must be. Also, while the executives continue to come from wealthy families in disproportionate numbers, there is a declining proportion from such wealthy families – 36 per cent in 1950 as compared with 46 per cent in 1900.

Still another indication of increasing professionalization of business management is the attitude of the executives themselves. A recent investigation of highly paid business executives in California showed not only that the majority worked overtime, but that these were happier than the group who kept more regular hours. They were definitely interested in their jobs and worked overtime because they liked what they were doing. It is true that the compensation of our top business executives ranges considerably higher than that in most professions. And this, too, is an important incentive. But there is general agreement that the principal attraction lies in the interest of the work itself.

Finally, it is apparent that a professional code of business ethics is developing and is receiving wide acceptance. I have no quantitative data to prove this, but illustrations can be cited. For instance, a number of top executives of 1900 held important government positions at the same time. Today, the top officials are expected to give full time to their business position, and if they leave it – as they must – when they accept high government positions they may not even retain their stockholdings in the corporation they formerly headed. Any such close alliance between business and government is viewed with misgivings. Also the presidency of a large company was used all too often, at the beginning of this century to make a quick profit for the president himself, even though such financial manipulation might leave the corporation bankrupt. Today the small stockholders' rights are usually protected by the top officials. They even urge the stockholders to participate personally in stockholders' meetings, and to interest themselves in other ways in the company's affairs. The man who, after spending the major part of his working life with one corporation, is rewarded with the presidency, has a loyalty to the organization that is hardly less than the pride of the founder. And he tends to think in terms of the welfare of the corporation itself. Nor is his concern limited to the company and its stockholders. The general welfare is recognized, not only in public statements but with increasing frequency by appointing representatives of the general public to the board of directors. And while one may take exception to Secretary Wilson's statement that

what is good for General Motors is good for the country as a whole, at least it shows recognition of the fact that the general welfare must be reckoned with. Not even the most obtuse of today's top executives is likely to be caught expressing sentiments such as those in the remark attributed to W. H. Vanderbilt, "The public be damned."

These changing standards are in part the result of government restrictions. But these restrictions are the reflection of a changed public attitude which the majority of officials appear to accept. Many officials are even convinced that these standards are in the long-run interest of business itself, and they participate actively both in formulating and in enforcing them.

Summarizing the evidence that the leaders of big business are developing a profession of business administration, it should be noted first, that wealth and family position have declined in importance as a way to the top; second, that the amount of formal education expected has increased; third, that increasingly long years of experience are required before being entrusted with top positions; fourth, that the officials themselves are for the most part completely absorbed in their work; and, fifth, that a professional code of ethics is emerging.

Too much should not be claimed for this, however. Wealth and family position are still important, and the nature of formal education for administration has not been standardized to the extent that it has been in law, medicine, and engineering, for instance. And most of the officials with a professional education have obtained it in another profession than that of business administration. To that extent it is a vicarious profession. No specific examination or degrees are requirements for entrance into the profession; and long years of faithful service may be an acceptable substitute for well-rounded training and experience. Also, the code of ethics, while undoubtedly developing, is still somewhat amorphous.

Turning to the apparent reasons for this development toward professionalization of business administration, the important ones can be quickly enumerated. The increased size and age of our leading corporations have brought separation of ownership and control. Very few really large family corporations remain. Within the past few months, for example, steps have been taken to make a public offering of the stock of both the Ford Motor Company and the Campbell Soup Company. These are among the very few large corporations still under family control. The management control which necessarily results from dispersion of ownership tends to become a

kind of self-perpetuating trust, with promotion from within, and – when possible – expansion from its own profits, thus freeing itself from the outside control of the bankers. Many corporations today have predominantly, or completely, inside boards made up of full-time officers of the company. And it may be noted, incidentally, that the record of the inside boards is better than that of the outside boards, although this is contrary to the accepted principles of administration. The interest of these lifetime employees of the company becomes identified with the interest of the corporation itself, and – one step removed – with the interest of the multitude of stockholders. This leads to more emphasis on training for what has become a highly skilled, lifetime job. The sheer size of the hundred million or billion dollar corporation makes dilettantism unthinkable. The stakes are too large.

One of the consequences of control by salaried professional managers, instead of investors, is that the pressure for immediate profits is lessened. The managers can afford to take a long view. This often means using a large share of the profits for expansion, which contributes to production on the one hand, and, by increasing equity capital, reduces the risks of failure on the other. It may even lead to continued production when the business outlook is uncertain. General Motors announced publicly last spring that they were betting $1 billion on prosperity. In other words, they were launching a $1 billion expansion program in the face of a business recession. It has been suggested that the engineers, who so often reach the top, will be more interested in production than in profits, and will not tolerate the "conscientious withdrawal of efficiency" which Veblen associated with the big businessman. On the other hand, a lifetime devoted to working up slowly in one department of one corporation cannot be depended on to develop breadth of vision or the imagination and daring that are associated with progress.

The professionalization of business, as far as it has developed, has not been planned. The fact that the top executives have been trained in other professions than business administration is, alone, evidence of this. Again to quote Veblen, "industrial experts, engineers, chemists, mineralogists, technicians of all kinds, have been drifting into more responsible positions in the industrial system and have been growing up and multiplying within the system, because the system will no longer work at all without them."[3] And there is still much to be done before business administration as a

[3] Thorstein Veblen, *The Engineers and the Price System* (New York, 1921), p. 44.

profession can achieve the prestige of engineering, law, or medicine. Much of its present prestige comes from financial rewards and power rather than from the skills required.

Nevertheless, it seems quite possible that the professionalization of big business will in the long run make an important contribution toward solving the so-called problem of big business. We have tolerated the giant corporation in this country, even while we have feared it, because mass production is efficient. It is usually given a large part of the credit for our high and rising planes of living. Consequently, we have been half hearted in our enforcement of the antitrust laws. And we have continued to hope that big business could be controlled for the public good, rather than destroyed. Professionalization of leadership in the big business corporation appears to offer one possible route to this end. The critics used to talk about the "heartless and soulless" corporation. Some of them today are discovering the "corporate conscience."

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Engineering Education as Preparation for Management: A Study of M.I.T. Alumni[1]

The processes whereby technical know-how is translated into business decisions are not widely understood; neither is there much definitive information about the role the engineer historically has played in administration. The data upon which this paper is based suggests that management of modern enterprise has been increasingly dependent upon graduates of engineering schools. The facts and implications are of interest not only to historians, but to businessmen and educators.

The part played by the engineer in directing the growth of American industry is at best imperfectly understood. We have as a nation regarded technical proficiency very highly and have indeed taken it for granted that our unique material well-being stems largely from our possession of an exceptional degree of technological "know-how." This assumption may be perfectly justified; if, indeed, we accept it as a working premise, the role of the engineer becomes an even more intriguing subject. Technological progress is by no means automatic. There are choices to be made among competing techniques and decisions to be reached on whether the time is ripe for a given innovation. Errors are likely to be disastrous for individuals or business organizations and damaging to society insofar as they may lead to an unproductive utilization of resources.[2] It does of course occasionally happen that a miscalcula-

[1] This paper was presented at the joint session of the Sheraton Group and the American Historical Association, New York, 28 Dec. 1954. The author wishes to express his indebtedness to the Research Center in Entrepreneurial History at Harvard and the School of Industrial Management at M.I.T. for the grants which have made this study possible.

[2] The various states which consciously chose to put the greater part of their effort into canals rather than railroads during the internal improvement boom of the 1830's may be cited as an example. Valuable as the canals were, the states certainly gained less than they would have if they had built railroads instead. Cf. J. B. Rae, "Federal Land Grants in Aid of Canals," *Journal of Economic History*, IV, no. 2 (Nov., 1944), 171.

tion results in something being done that might not have been undertaken had information been more accurate,[3] but on the whole it seems wiser to assume that good judgment is preferable to bad.

Our problem is to try to determine to what extent the engineer, as the trained technological expert, has been responsible for making these choices and decisions, and beyond that, to what extent he has been considered the proper person to do so. Finding a solution promises to be a lengthy and somewhat arduous operation, not only because of the magnitude of the problem, but because little of the information required to arrive at a satisfactory conclusion is as yet available. Discussion of the fitness of the engineer for management has been going on for a long time. The case for the engineer was strongly stated as early as 1869 by John B. Jervis, one of the greatest of early American engineers,[4] and in 1894 the first issue of *Engineering Education*, the journal of what is now the American Society for Engineering Education, contained a strong plea to engineering colleges to give their students a broad liberal education in order to fit them better for the executive positions that they ought to be filling.[5] On the other side of the argument we find it asserted within the profession itself that "the engineer and the business man belong to two distinct callings, which, essentially, have really nothing in common" and that the engineer's contribution to industrial growth should be recognized as due to his technical knowledge and ability rather than to his executive and administrative capacity.[6]

The issues thus presented are still unresolved and are likely to remain so as long as discussion of them is couched in terms of abstraction and intuition. We need some quantitative data – not in the expectation that a problem in which the human element figures so largely can be solved quantitatively, but simply because it is impossible to arrive at a conclusion of any kind until we are in possession of some basic facts.

The purpose of this paper is to explore one of the sources of factual information: namely, the records of graduates of engineering colleges. I have concentrated upon M.I.T. alumni, for the simple reason that these records have been readily accessible to me. The

[3] For an interesting discussion of this phenomenon see John E. Sawyer, "Entrepreneurial Error and Economic Growth," *Explorations in Entrepreneurial History*, IV, no. 4 (May, 1952), 199–204 and Hugh G. J. Aitken, *The Welland Canal Company* (Cambridge, 1954), pp. 30, 41–42.

[4] American Society of Civil Engineers, *Transactions*, I (1872), 149.

[5] William H. Burr, "The Ideal Engineering Education," *Engineering Education*, I (1894), 20–21.

[6] G. Siebert, "The Commercial Management of Engineering Works," *The Engineering Magazine*, XXII (Feb., 1902), 655.

results appear in the accompanying tables. Table 1 was compiled from the Register of Graduates for 1910, showing all classes through 1909 and including some 4,100 active alumni;[7] Table 2, from a questionnaire conducted in 1939 by the Alumni Placement Office of M.I.T. and including almost 6,500 active alumni.[8] A similar survey, in which about 12,000 replies were received, was made in 1947 and some of its results have been analyzed in a master's thesis which may be found in the M.I.T. Library.[9]

While every effort has been made to organize the data so that these surveys are comparable, some caution in interpreting the figures is advisable. Classifications are not absolutely identical, and the nature of some of the positions reported has had to be surmised. Nevertheless, the aggregate numbers represented seem large enough to allow for a substantial margin of error and still make possible the drawing of conclusions with a reasonable presumption of validity.

For our purpose the most interesting feature of these tabulations is what has happened to those classified as executives. In 1910, 9 per cent of the active M.I.T. alumni[10] were in this group;[11] 30 years later the proportion had risen to 20 per cent; and in 1947 it had climbed to 22.1 per cent.[12] This trend can be accounted for in part by the fact that the proportion of trained engineers in the total population has increased, but it can hardly be explained on this ground alone. The indication is unmistakable that the likelihood of an engineering graduate moving into an executive position has become steadily greater during the last half century.

A second conspicuous, and probably equally important trend is the marked increase in the ratio of executives among the older

[7] M.I.T. *Bulletin*, Vol. 45, no. 3 (March, 1910).

[8] The results of this questionnaire were made available through the courtesy of Mrs. Evelyn B. Yates of the M.I.T. Alumni Placement Office.

[9] Paul A. Simmons, "An Investigation of Employment Patterns Being Established by M.I.T. Alumni," Thesis for Degree of Master of Science, Department of Business and Engineering Administration, M.I.T., 1950. This study concentrates on graduates of four selected professional courses, but it also has some general figures.

[10] "Active" is used here to exclude the retired group. Since the surveys do not indicate the previous occupations of those listed as retired, it seems wiser to omit them from calculation.

[11] The "executive" group included those who reported themselves under one of the following titles: chairman of the board, president, vice-president, director, general manager, business manager, secretary, owner, proprietor, comptroller, treasurer, assistant treasurer, and executive assistant.

[12] Simmons, *loc. cit.*, p. 45. The increase is actually greater, since this thesis sets up a separate category of Finance and Accounting, which includes the comptrollers and treasurers.

TABLE 1

Register of Graduates, March, 1910

Years of Graduation		Before 1880	1880–89	1890–99	1900–09	Total
Total Active Alumni Reported		179	364	1409	2140	4092
Executive	no. in group	38	76	176	98	388
	per cent	21	21	12.5	4.6	9
Sales Advertising Credit	no. in group	.....	9	45	44	98
	per cent	.....	2.5	3	2	2.4
Production Management	no. in group	6	32	133	176	347
	per cent	3.4	9	9	8	8
Transportation Management	no. in group	1	3	9	9	22
	per cent		insignificant			.5
Miscellaneous (Banker, broker, exporter, importer, investment manager)	no. in group	7	19	38	10	74
	per cent	4	5	2.7	insignificant	1.8
All others		127	225	1008	1803	3163

Source: This material is based on M.I.T. *Bulletin*, Vol. 45, no. 3.

TABLE 2

M.I.T. Alumni Questionnaire, 1939

Years of Graduation		Before 1890	1890 –99	1900 –09	1910 –19	1920 –29	1930 –39	Class not listed	Total
Total Active Alumni reported		28	188	576	993	2183	2455	35	6458
Executive	no. in group	15	72	216	343	448	206	11	1311
	per cent	53.5	38	37.5	34.5	20.5	8	31	20
Sales Advertising Credit	no. in group	....	14	60	169	486	427	4	1160
	per cent	....	7.4	10.4	17	22	17	11	18
Production Management	no. in group	....	3	34	51	109	64	1	262
	per cent	....	1.6	6	5	5	2.6	3	4
Transportation Management	no. in group	....	1	1	....	6	8	....	16
	per cent	....	insignificant						.2
Miscellaneous	no. in group	....	2	3	12	26	5	....	48
	per cent	....	insignificant			1.2			.7
All others		13	96	262	418	1108	1745	14	3656

alumni groups. In 1909, 4 per cent of the graduates of less than ten years' standing were classed as executives, and this figure rises to 21 per cent of those who graduated prior to 1890 and had therefore been out of college over 20 years. In 1939 the corresponding figures start with 8 per cent of the less-than-ten-year group, increase to 34.5 per cent of the 20 to 30-year alumni, and rise to no less than 53.5 per cent of the alumni who had been out of college 50 years or more and were still active. The 1947 survey does not have these data tabulated for the whole alumni group, but its analysis of the graduates in Mechanical Engineering, Chemistry, Chemical Engineering, and Business and Engineering Administration shows the same progression (see Table 3) – with two special features worth pointing out. First, the chemists have been somewhat less prone to go into management than the engineers, and second, the graduates of the business administration course, while ahead of the others, by no means dominate the executive group.

TABLE 3

PERCENTAGE OF GRADUATES IN EXECUTIVE GROUP

Years of Graduation	Course II Mechanical Engineering	Course V Chemistry	Course X Chemical Engineering	Course XV Business and Engineering Administration
1910–19	39.4	30	45.8	47.4
1920–29	33.7	11.1	35.5	41.2
1930–34	18.9	11.1	20.3	36.8
1935–39	12	19.2	11.4	25.7
1940–44	10.8	10.6	4.2	17.3
1945–46	7.3	.....	3.6	5.5

SOURCE: The data contained herein is based on P. A. Simmons, "Employment Patterns of M.I.T. Alumni," pp. 58, 62, 65, 68.

There is a qualitative element to be considered here. It can be taken for granted that in general the older men hold the more responsible positions. The distribution shown in Table 4 provides at least partial confirmation, subject to the qualification that the title may not always be an accurate measure of the importance of the position. Nevertheless, the fact remains that the heaviest proportion of executives among the M.I.T. graduates occurs in the age groups where upper-level management is also most likely to be concentrated. This is a factor admittedly difficult to measure, but it does suggest that the role of the engineers who have gone into

management has been an influential one as far as the determination of business policy is concerned.

The picture presented by these surveys raises some questions concerning the development of American business and business organization which cannot now be answered but which can properly be called to the attention of students of business history. The steadily increasing flow of engineers into managerial posts is at-

TABLE 4

DISTRIBUTION OF MANAGERIAL POSITIONS HELD BY M.I.T. ALUMNI IN 1939

Years of Graduation	Pre-1890	1890 –99	1900 –09	1910 –19	1920 –29	1930 –39	Totals
			General Executive				
President; Chairman of Board	9	24	61	75	50	10	229
Vice-President	1	10	53	98	90	29	281
General Manager; Business Manager		11	33	49	87	40	220
Secretary	1	3	15	23	38	19	99
Owner; Proprietor	1	11	28	51	102	50	243
Comptroller			3	2	5		10
Treasurer	2	6	14	26	15	7	70
Assistant Treasurer		1		4	7	9	21
Executive Assistant		3	6	13	42	35	99
			Production and Manufacturing				
Works Manager; Agent		2	16	19	28	7	70
Superintendent		1	18	27	61	28	134
Assistant Superintendent				5	20	29	54
			Transportation				
Superintendent		1	1		4		6
Assistant Superintendent					2	8	10
			Miscellaneous				
Banker		1	1	1	9	1	13
Exporter and Importer			1	3	8	2	14
Investment Manager		1	1	8	9	2	21

SOURCE: The data contained herein is based on M.I.T. Alumni Questionnaire, 1939.

tributable to the fact that our industrial processes have been growing more complex technologically and have therefore required a constantly greater degree of technological training in the ranks of management, but this explanation may not go far enough. Is not this phenomenon one of the signs of a tendency toward specialization of management, whereby business organizations, especially the large ones, are coming to be run by groups which combine a variety of skills and training? While this is not the place for an extended discussion of the growth of committee management, it can be pointed out that a large business enterprise can seldom be conducted effectively as a one-man show.[13] Even where ultimate responsibility for policy-making is vested in a single individual, his choices are likely to be governed by the advice and information he receives from associates who are experts in their particular fields. Whether this need for technological representation in the decision-making process has been a prime factor in drawing engineers into management is a subject which invites further study.

Two of the other categories tabulated call for some comment. First, the percentage of graduates engaged in production or transportation management, functions for which engineers would seem particularly well suited, is surprisingly small. This circumstance is undoubtedly due to lack of precision in classification. We can be certain that many of those included in the executive group, notably among the vice-presidents and general managers, were primarily production managers, and similarly that many of those whose titles caused them to be listed as engineers were actually in administrative posts. Nevertheless, the fact remains that on the basis of the information we possess, the great majority of the executives among the graduates of M.I.T. exercised responsibilities beyond the supervision of strictly technical operations.

Second, the most striking change between the surveys of 1910 and 1939 occurs in the proportion of alumni engaged in sales, advertising, and credit activities – from 2.4 per cent in 1910 to 18 per cent in 1939. It is of course a reflection of the increased emphasis on marketing which characterized American industry during this period, but the attractiveness of the field to engineers is somewhat unexpected.[14] It would be interesting to know to what extent this development reflects the continued expansion of technology – i.e., are men with engineering training required in marketing because

[13] A good example is provided by the contrast in the methods employed by William C. Durant and Alfred P. Sloan, Jr., in the management of General Motors, which is lucidly presented in Paul F. Douglass, *Six Upon the World* (Boston, 1954), 142–3.

[14] The fact that the course in Business and Engineering Administration was

business is producing and trying to sell technical equipment in constantly larger quantities and of growing complexity? As a matter of fact, the debate on the fitness of the engineer for management can be matched by one on his fitness for salesmanship. At its first meeting the Society of Automotive Engineers discussed whether technical equipment could best be sold by an engineer trained in salesmanship or a salesman primed with the requisite technical information.[15] Opinion then was about evenly divided, but it appears that in actual competition the engineer has come out fairly well.

When this marketing category is added to the executive and other management groups, the very interesting result is obtained that during the last 40 years almost half the alumni of M.I.T. have gone into business in roles other than that of the professional engineer. If this consideration applies to engineering colleges in general – and there is no reason to believe otherwise – then a reappraisal of their educational contribution is in order, in that they have been producing not only technological experts but also a kind of talent which has been increasingly in demand to fill managerial and promotional roles.

More detailed information than these surveys provide can be secured by examining particular groups. I have chosen for this purpose the classes of 1884 and 1893 at M.I.T., since the careers of their graduates cover a time span reaching well into the twentieth century, and still more because these two classes, at their twenty-fifth and thirtieth anniversaries respectively, not only compiled satisfactorily full accounts of what their members had been doing but also collected opinions from these members regarding the value of the training M.I.T. had given them.[16]

Of the 91 members of the class of 1884 about whom information was available in 1909, 20 had attained what can be regarded as major executive or managerial posts.[17] Four of these stepped out of college into a family business; the rest almost without exception began their careers in technical capacities and gravitated into managership later. Of those who commented on the value of their

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added to the M.I.T. curriculum after 1910 accounts for some of this increase but not by any means all of it. In 1947 the proportion of Course XV graduates in this field was not appreciably greater than the others; Cf. Simmons, *loc. cit.*, pp. 45, 68.

[15] Society of Automotive Engineers, *Bulletin*, I (1911), 3.

[16] Class of 1884, M.I.T., *Twenty-fifth Anniversary Book* (Boston, 1909); Class of 1893, M.I.T., *Thirtieth Anniversary Report* (Boston, 1924).

[17] The class secretary claimed 42 "presidents or managers of important industrial enterprises" (Class of 1884, *Twenty-fifth Anniversary Book*, p. 306), but this computation must have been made in a spirit of reunion exuberance or else on the basis of information not included in the class book.

education, seven said without qualification that their technological training had benefited them in business, while seven others agreed on the utility of their training but felt that it could profitably have been supplemented either by a general college education or by training in business administration.

The class of 1893 presents a substantially similar picture. At its 30-year mark, 70 out of 318 members had achieved business prominence. Twelve had gone into family concerns; a few of the rest had begun their careers in nontechnical positions (some of the biographical sketches are not clear on this point), but the majority had adhered to the pattern of starting in the work they had been trained for and arriving in management later. Curiously enough, despite the greater number of individuals involved, there is less diversity of opinion on the value of technical education as preparation for business management.

Twenty-one out of the 70 expressed themselves on the subject. Fourteen were favorable, sometimes enthusiastic. For example, the treasurer of a bank stated that his M.I.T. training had fitted him for the ethics of banking,[18] a producer of iron and steel castings said, "My Tech training has been the foundation of everything I have done since leaving," [19] and the president of a water filtration company testified, "Tech training gave me my first job and subsequent advancements." [20] One man, an executive of the Libbey-Owens Glass Company, stands out because he stated categorically that he had gone to M.I.T. with the intention of preparing himself for executive work and considered the professional course he had taken (Chemical Engineering) to be admirable training for this purpose.[21]

Three men were lukewarm. A manufacturer of woolens said that his work at Tech had been good training in concentration but not otherwise valuable,[22] and the president and owner of the National Machine and Tool Company of Boston felt that the only thing he had got from his education had been confidence in his ability to overcome difficulties.[23] The third, engaged in the elevator business, simply stated, "I don't know as I can definitely state how Technology training has benefited me, but am positive it never did me any harm." [24]

[18] Class of 1893, *Thirtieth Anniversary Report*, p. 99.
[19] *Ibid.*, pp. 204–5.
[20] *Ibid.*, pp. 220–1.
[21] *Ibid.*, pp. 150–2.
[22] *Ibid.*, p. 80.
[23] *Ibid.*, p. 246.
[24] *Ibid.*, p. 151.

Four had suggestions for improvement of the curriculum, either in the direction of greater breadth or more definite business training. Two of these require full quotation. An executive of a soap company said,[25]

> The present tendency seems to be to train the student to be either a technician or an executive. This to my mind is a mistake. A good executive must know his business thoroughly and cannot learn it in the office. He must begin in the works and can find a place there only by knowing technology and can get out of the works only by knowing business.

The other, who was superintendent of the American Biscuit Company, advised,[26]

> Have professors and teachers who are human, not merely intellectual machines. Also have a course to teach students how to think and stop cramming their minds with useless book learning.

This is admittedly a limited sampling, but a revealing one nonetheless. Few of these men had chosen an engineering education with the conscious intention of preparing themselves for management. Only one, indeed, testified that he had gone to M.I.T. for this purpose, but we may assume that those who went into family businesses – 16 in the two classes – expected to take over their management eventually. The others, the great majority, were aiming primarily at technological careers, although many of them undoubtedly had hopes of ultimately attaining high executive position. Most, when they did find themselves in such posts, considered that their technological training had helped to fit them for their roles, with a respectable and certainly articulate minority contending that the engineering curriculum, while useful, needed to be supplemented both by more general education and by specific business training.

Since it is reasonable to assume that the alumni of the other major engineering schools in the United States have followed approximately the same career patterns as those of M.I.T., technological education has obviously been an important source of administrative talent for American industry. Whatever imperfections the evidence presented here may have, it makes abundantly clear the fact that the flow of engineering graduates into management has been persistent, substantial, and steadily increasing in volume. Some of this movement is doubtless accidental; examination of specific cases would probably show many in which, as with the gentleman whose

[25] *Ibid.*, p. 213.
[26] *Ibid.*, pp. 244–5.

M.I.T. education had never done him any harm, there was little perceptible relationship between the engineering training and what the person did afterward. On the other hand, the influx of engineers into management has been too great to be written off in terms of chance or coincidence. The majority must be deemed to have reached executive rank because there was a definite demand for managerial personnel with their particular skills. In other words, it was precisely because they were engineers that they were recruited into management.

How well they met this demand is a question which lies beyond the scope of this paper, since quantitative data cannot be used to make qualitative judgments. The steady rise in the proportion of engineers gravitating to management may be taken as an indication that they have proved reasonably successful in executive roles, even though it does not tell us in what ways their technological training contributed to this result. We can, however, be certain that the engineers have been strongly enough represented in the direction of business and industry in the United States to make their influence worth investigating. This again is an area of unsolved problems. We should expect, for example, to find the engineers most prominent in the management of the industries with the most elaborate technology, but we cannot as yet determine whether such a relationship exists.[27] Within the same industry individual firms can show marked variations in their standards for the selection of executives, frequently for no reason more obvious than that of acquired habit.

As a final consideration, it may be pointed out that this subject is more than an aspect of the history of American business management. It is an area in which past experience can be used directly as a guide to present policy. A record which shows that at least one in five of our engineering graduates is to be found in some kind of managerial role, and that as they advance in their careers the ratio approaches one in two, is something to be taken into account in planning technological curricula. Since engineering education has been producing business executives in quantity anyway, it would appear desirable to find out to what extent it has been producing good ones, and from that to determine what it might do, without losing sight of its main purpose, to produce better ones.

[27] The author has been studying this problem and some of his initial findings are presented in "The Engineer as Business Man in American Industry: A Preliminary Analysis," *Explorations in Entrepreneurial History*, VII, no. 2 (Dec., 1954), 94-104.

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Recruitment of Business Leaders: A Commentary on the Newcomer and Rae Papers[1]

These interesting papers and the data they present offer further testimony to the increasing study and understanding of the position of the businessman in our society. In general they focus on two topics: the recruitment of the business executive and the influence of recruitment patterns on the occupational role of the business executive. It would be redundant to attempt to elaborate further the careful and concise conclusions reached by the authors. A more rewarding use of this opportunity for discussion might be to make some examination of these data from an alternative point of view, readdressing them from a somewhat different theoretical position. From such an examination it may be possible to explore further the recruitment process in our business system.

The authors have taken as their point of reference the amount and type of higher education of the future business leader. An alternative, more familiar in the field of sociology, is to examine the career as a life-long process, with college education as but one important aspect of the total recruitment and training pattern. Thus business leadership is seen as a special case of the larger problem of occupational recruitment, the process by which in our society individuals come to occupy similar or different occupational positions from that of their parents, with personality as well as social and economic factors playing a part in the process.

Movement to business leadership is seen in this view as part of the total social experience of the individual. Just as business executives in America are members of the higher socio-economic strata of our society, so are most future business leaders recruited from this class level, and most are then sons of business executives, pro-

[1] Delivered at the joint session of the Sheraton Group and the American Historical Association, New York, 28 Dec. 1954.

fessional men, and the like. A college education is taken for granted at this class level, and young men enter college as a matter of course, as part of their total life pattern. Some few young men from other backgrounds, sons of laborers and white-collar workers, also enter college. Some among these acquire the formal and professional skills, as well as the less formal but no less important social skills they must have to become appropriate candidates for occupational positions different from those of their families of origin.

All of these remarks deal with very general and familiar matters. They are made not to explain occupational recruitment, but to recall to your attention a general view of society and of occupations from which to examine the data of these papers. This approach is in no way exclusive of, but is supplemental to, that put forth by the authors of the papers.

As an example of the possible results of this approach, Mr. Rae's data may be looked at in a somewhat different light from that of his very thorough report. He finds a "steadily increasing flow of engineers into managerial posts," and attributes this increase largely to the increasing demands for technological skills in the executive role. It is assumed that for the most part the student engineer – in social origins, academic setting, and career orientation – has remained a constant factor over the past half century.

In the approach sketched above, the assumption may be examined and alternative interpretations can be suggested. Thus, it may be that since 1890 the social status of the engineer has increased. If this be so, it would seem likely that young men of higher status backgrounds would be attracted to the study of engineering, and a normal consequence in our society would be a generally higher occupational status for engineering students in their ultimate careers. That is, men from higher status origins tend to occupy in high proportion higher status occupations. Thus, changes in student recruitment would change occupational outcomes as part of broader tendencies to social class stability over the total life span.

Then, too, it may be that the prestige of those educational institutions training engineers has increased. Massachusetts Institute of Technology may well have enjoyed such an increase to a greater extent than comparable institutions. The probabilities of a high level of career success are distinctly enhanced by graduation from certain colleges and universities; an increment in the evaluation of engineering schools by the business and broader social community would benefit future graduates. To the extent that this increment accrues to a few schools, they might supply the higher level occupa-

tions in larger proportion, while lower levels of the profession continue to be recruited largely from less well-considered institutions.

This kind of alternative explanation of Mr. Rae's data is of course susceptible to research verification given the proper opportunity. Another aspect of the problem is less accessible but nonetheless intriguing. It seems quite possible that within the field of engineering, if it has indeed come to enjoy increased prestige, a certain division among students has developed. As has certainly occurred in law, for example, it might well prove to be the case that a substantial group of students remain primarily oriented to the profession as a profession, and to the technological problems addressed by the profession. Another group of students, perhaps more numerous today than in the past, might view their training as providing an appropriate and acceptable background and set of mind, but these students would be oriented to a more general career. In this event, during that period of on-the-job selection and training noted by Miss Newcomer, these contrasting groups would be sorted out. The men primarily oriented to technology would be recruited into those important but specialized positions in research laboratories and production settings while the other group was channeled largely into more general positions, as sales and executive roles. It should be noted that the observed changes in recruitment of engineers by this argument would be taking place without reference either to the changing technology of the business system or the particular content of the engineering curriculum.

On the whole, looking at the problem from the point of view of this discussion, Miss Newcomer's paper presents another example of the conflict in our society between trends to increased openness of the system, with a relatively high rate of social mobility, and trends to increasingly rigid stratification. The decline in direct inheritance of position, accompanying the growth of the large and rationalized corporate structure, has clearly facilitated structural openness. Conversely, the trend to setting a college degree as a minimal prerequisite for executive selection excludes the far larger part of the population from such mobility chances. What Miss Newcomer terms professionalization may be an example of the general trend to specialization of most occupational roles in our complex society, for many of the criteria for professional status are clearly absent from the executive role. However, this specialization insofar as it denotes formalization and rigidity contains dangers for an open society like ours.

Indeed, these papers seem to point directly to the weakest link

in the chain of events that lead to social mobility in America. They both underline the increasing importance of higher formal education in recruitment to higher status occupations in the business system. To an increasing extent, the higher reaches of our occupational system are as open to men of lower status origins as are our colleges and universities. The rapid expansion of the great state universities especially, and of higher education in general, has for some decades had an accelerating effect on mobility in America, compensating for many factors that work toward status rigidity. It may well prove to be that a continued high level of social mobility in American business will depend on the degree to which the colleges, and the private ones especially, continue to recruit students from all strata of our society.

Business History Programs

AT THE MISSISSIPPI VALLEY HISTORICAL ASSOCIATION ANNUAL MEETING

Programs of particular interest to business historians are scheduled at the Mississippi Valley Historical Association annual meeting, Hotel Jefferson, St. Louis, April 27–30.

WEDNESDAY EVENING, April 27: Lexington Group dinner and meeting

Topic: *St. Louis, the Gateway to the West*

Papers: "The Mississippi: St. Louis' Friend or Foe," JAMES H. LEMLY, University of Georgia

"Louis Houck: An Early Short Line Railroad Builder in Missouri," WILLIAM T. DOHERTY, JR., University of Arkansas

"The Santa Fe Entry Case: A Study in Regional Transportation Problems," LAWRENCE G. LAVENGOOD, Northwestern University

Chairman: W. J. BURTON, Missouri Pacific Railroad

Special features: Exhibit of material relating to St. Louis railroad history at Hotel Jefferson; outdoor exhibition of railroadiana at Barretts Station; visit to the Museum of Transport

THURSDAY MORNING, April 28

Topic: *Business History: Three Perspectives*

Papers: "What's Been Done, and What Remains: A Survey with Suggestions," RICHARD WOHL, University of Chicago

"Can the Records Manager Help the Business Historian?", RICHARD C. OVERTON, Northwestern University

"Are Business History and Economic Theory Com-

patible?", DONALD E. STOUT, University of California at Los Angeles

Chairman: VINCENT P. CAROSSO, New York University

THURSDAY AFTERNOON, April 28

Topic: *Engineering and Technology*

Papers: "American Technology and the 19th Century Ideal of International Understanding," HUGO A. MEIER, Carnegie Institute of Technology

"The Engineer Entrepreneur in the Automobile Industry," JOHN B. RAE, Massachusetts Institute of Technology

Chairman: JOHN OLIVER, University of Pittsburgh

FRIDAY MORNING, April 29

Topic: *Oil in California!*

Papers: "The Beginnings of the Modern California Oil Industry," GERALD T. WHITE, San Francisco State College

"Benjamin Silliman, Jr., and Early California Oil Explorations," E. DEGOLYER

Chairman: CARL COKE RISTER, Texas Technological College

SATURDAY MORNING, April 30

Topic: *Industry in the New South*

Papers: "Northern Financial Interest in Southern Railroads, 1865–1900," JOHN F. STOVER, Purdue University

"Paul Bunyan Moves to Mississippi," JAMES W. SILVER, University of Mississippi

Chairman: BELL I. WILEY, Emory University

THE AMERICAN SYSTEM

A Review Article

The role of government in the ante-bellum American economy has been boldly redefined in a score of books and articles published during the past decade.[1] Close analysis of state and local sponsorship of enterprise, initiated and supported by the Committee on Research in Economic History,[2] has suggested a thesis that appears to invite a new view of American capitalism in its formative years. Taken together, the works here reviewed form a consistent report of economic endeavor in an almost unfamiliar land. There, the elected public official replaced the individual enterpriser as the key figure in the release of capitalist energy; the public treasury, rather than private saving, became the major source of venture capital; and community purpose outweighed personal ambition in the selection of large goals for local economies. "Mixed" enterprise was the customary organization for important innovations, and government everywhere undertook the role put on it by the people, that of planner, promoter, investor, and regulator.

No scholar has yet attempted a general description of an America so dependent on its public authorities. The several authors who have conducted the recent surveys of little known state and local functions have carefully qualified their findings, and each has confined himself to a specific area or a selected problem in his restatement of the relation of government to enterprise. The most ambitious and inclusive accounts of positive state endeavors may be found in the articles and monographs of Louis Hartz, and Oscar and Mary Handlin. Concerned primarily with what the people wanted from their governments, rather than with what they got, Hartz and the Handlins were free to let their speculations carry them to extreme views. More limited but more impelling conclusions are presented in the works of Carter Goodrich and Milton Heath: their restraint lends force to their views of the carefully defined issues they analyze. Harry Pierce, John Cadman, James Neal Primm, Earl Beard, and others avoid bold generalizations, but add essential detail to the Goodrich-Heath story. These authors are united in their belief that the activities of state and local governments were of crucial importance in the stimulation of enterprise in the United States. Their variations on this theme are so numerous that the principal concern to which all return is surprisingly familiar. Their common specific task is the rescue of the internal improvements movement from the political historian, and the inflation of this issue as primary evidence for their new view of America's economic organization. In their report of the struggle of communities and states for control of inland produce or for access to markets, they document the emergence of a sturdy tradition of public responsibility for economic growth. The tradition as they describe it, persistent to the very end of the nineteenth century, was so extensively employed that it seems expanded in no theoretical respect by its modern uses in the Tennessee Valley or in the exploitation of atomic energy.

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Recent notice of the age and respectability of this tradition began with attack on what Louis Hartz called the " 'laissez faire' cliche" that "has done

much to distort the traditional analysis of our early democratic thought" (Hartz, 2, xi). Historians, according to Hartz and others, have compounded this distortion by concentration on national issues, and by excessive concern with limitations put by the Constitution or by jealous sections on the Federal government. The story obscured, meanwhile, has been that of the broad uses to which the ante-bellum states put the powers reserved to them in a Federal system. In three papers read to the 1943 meeting of the Economic History Association, Oscar Handlin, Hartz, and Milton Heath reported that the states of Massachusetts, Pennsylvania, and Georgia were in no way inhibited by laissez-faire notions. "In the realm of the practical," observed Handlin, "there never was a period in Massachusetts history when this conception was of the slightest consequence. From the very first organization of the Commonwealth in 1780, the state actively and vigorously engaged in all the economic affairs of the area, sometimes as participant, sometimes as regulator" (Handlin, 1, 55). Of Pennsylvania, Hartz later said that, "Far from being limited, the objectives of the state in the economic field were usually so broad that they were beyond its administrative power to achieve" (Hartz, 2, 292). Milton Heath concurred, though with variations, when he concluded that of Georgia "it may be said that during the early decades there developed no definite philosophies defending the exclusive validity of either individual or public action" (Heath, 3, 100).

King Laissez Faire, then, was according to these reports not only dead; the hallowed report of his reign had all been a mistake. The error was one of monumental proportions, a mixture of overlooked data, interested distortion, and persistent preconception. Scholars who tried to set the story right, moreover, found the void before them yawning constantly wider. Authors of the first major books addressed to the issue met with boldness and imagination the problem of guiding readers through a land from which theoretical signposts had been removed. Oscar and Mary Handlin, and Louis Hartz, who published their full-length studies of Massachusetts and Pennsylvania in 1947 and 1948, were engaged by hypotheses that outreached their evidence, but the shock effect of their works was a useful stimulant to fresh and original thought about the role of government in early state history. It now seems evident that the Handlins and Hartz, in their enthusiasm for the demolition of laissez-faire mythology, substituted new theories almost as unsatisfactory as the ones they so adequately undermined. They were victims, in a way, of the assumptions they discovered to be false when employed in description of the ante-bellum period. Instead of eliminating the laissez-faire theme from analysis of public policy, they merely changed its chronology. Each assumed general adherence to the philosophy *after* the mid-century point at which their studies ended; and with this presupposition they gave to their account of earlier alternative policies a tone more appropriate for description of antique curiosities than for revelation of continuing themes in American economic history. They wrote as though state sponsorship of economic development had been an all or nothing proposition, a point of view that obligated them to demonstrate the total collapse and failure of the schemes and visions they had discovered.

In this respect the Handlins' work was the more portentous: they were quick to admit that the "commonwealth" policies (their name for persisting elements of mercantilist theory and practice in Massachusetts) were doomed from the start. According to their theory Massachusetts emerged from the Revolution

composed of many diverse interests, but polity in the state was dominated by the "fact that transcending the interests of all its constituents was the interest of society . . ." (Handlin, 3, 30). This "unity behind diversity" was to be expressed by a "government prominent in the direction and management of productive enterprise" (Handlin, 3, 261). Ambition for bold public endeavors, however, was cramped by a narrow public purse and popular fear of debt. The state therefore operated through the grant of privilege or the gift of incorporation to private groups. Rapid extension of these grants weakened the concept of common interest, and led inevitably to the growth of a body of private rights with which the government could not interfere. The state matched its original broad purpose with growing policy in only one area, that of humanitarian reform — or, as the Handlins would have it, in "police state" functions. Otherwise their analysis of policies from the Revolution to the Civil War reveals a story of shrinking public ambitions, of "transition from the Commonwealth to the police state, from mercantilism to liberalism . . ." (Handlin, 3, 262).

The Hartz analysis revealed that in Pennsylvania there was equally persistent faith in mercantilist theory; there, as in Massachusetts, the Revolution simply meant belief in the "need for utilizing that principle exclusively for colonial ends" (Hartz, 2, 6). Pennsylvania, however, implemented faith with a remarkable array of plans, controls, investments, and public works. Policies of the state affected "virtually every phase of business activity, were the constant preoccupation of politicians and entrepreneurs, and they evoked interest struggles of the first magnitude. Government assumed the job of shaping decisively the contours of economic life" (Hartz, 2, 289). Through its chartering policy it registered influential opinions on the character and shape of banking and transport enterprises, and then on an increasing variety of industrial developments. As investing partner of enterprisers, it placed public directors on the boards of over 150 "mixed" corporations by 1844. Further, by the sale of public lands, and by the investment of more than $100 million in the public works system, the state, in its "entrepreneurial function . . . assumed major proportions" (Hartz, 2, 290). Humane regulatory policy was equally extensive, from the abolition of slavery in 1785 to the limiting of child labor in the 1850's. The state, in fact, acquired such extensive responsibilities that its bureaucratic machinery broke down; a "stable and expert administrative system . . . did not develop" (Hartz, 2, 293). Administrative failure was compounded by sectional jealousies within the state; the public credit was critically threatened by the hard times of the late thirties and early forties; and in the end the theorists of public enterprise were driven from the field by their erstwhile partners, the private directors of mixed corporations. Confident, mature, and no longer dependent on the public treasury for their existence, the now "private" corporations clothed themselves in individualist theory, and launched with "messianic vigor" a successful assault on the whole theory of state participation in enterprise.

Unhappily for a critic in search of a documented hypothesis, the image of the positive state thus revealed in the Hartz and Handlin monographs is limited by the authors' intentions to the status of an engaging speculation rather than a demonstrated reality. The authors set out to describe what the people of Massachusetts and Pennsylvania conceived to be the role of their governments, rather than to outline government activity; and with this definition of their

work as exercises in intellectual history, they very often relegated principal economic themes to the position of supporting detail. For the Handlins this approach permitted convenient and specific disavowal of any effort to "assess the effects of government action upon economic trends" (Handlin, 3, xii). Selection of the "commonwealth" theme permitted adequate proof for their belief that the state government was for many years expected to show formal interest in every public and private endeavor of material consequence — but from the evidence they present this concern was displayed without cash content or interested administration. Bemused with the curiosity about the Commonwealth pattern, they avoided analysis of substantial public aid to the emerging corporations whose legal form and rights they understand so well. Louis Hartz, on the other hand, was very much concerned with positive state policies, but only insofar as these policies would illustrate the half-century of debate that led on the eve of the Civil War to the emergence of a full-blown laissez-faire philosophy. Along the way he documented Pennsylvania's extraordinary excursions into state-sponsored transportation development, but the heart of his study lies not in what the state did, but in the story of how individual enterprisers and public planners alike lost control of both their theories and good works to the private corporations that supplanted them.

The Hartz-Handlin interpretation of the rise and decline of state ambition has not been adopted by students investigating related material. Scholars at work on similar themes have found that a smaller canvas and more thorough development of relevant detail brings them to conclusions quite different from those of the works just summarized. An effort to demonstrate the practice as well as the theory of state enterprise has required them to rely on more conclusive evidence than a summary of popular hopes and complaints; and they have found that achievements, as distinct from vague desires, were the products of somewhat more orthodox capitalist purpose.

The data repeatedly employed in analysis of state endeavors has been sought in study of public aids to railroads. No other public undertakings excited such extensive argument, nor attracted, in the end, so great a share of the public's capital. Careful review of causes and effects in the story of railroad aid became for Milton Heath and Carter Goodrich a means to general analysis of the role of government in ante-bellum economic development. Heath described in his 1937 Ph.D. dissertation the railroad building efforts of communities and states throughout the South. Goodrich, in six recently published articles, surveyed the hopes, methods, and achievements of officials directing government assistance at every level of public administration. Both men, writing as economists and students of planning, sought a contemporary relevance in the familiar story of "internal improvements." In the nineteenth-century American experience they hoped to find lessons that might prove useful to modern underdeveloped countries that are also faced with problems too great for the skill and capital of their private organizations. In applying the word "planning" to ante-bellum practices, they quite consciously gave the word its modern meaning — that is, the adoption by communities of "deliberate and concerted policies . . . designed to promote economic expansion or prosperity and in which positive action to provide favorable conditions for economic activity is emphasized more strongly than negative regulation or the correction of abuses" (Goodrich, 2, 16; Heath, 2, 1).

The end to which the planners aspired was neither the achievement of an all-embracing "commonwealth," after the Handlin definition, nor yet the crea-

tion of a permanent public stake in enterprise, according to the Hartz pattern. Rather, "public railroad promotion took on the character of positive planning for a freer private enterprise" (Heath, 1, 46; Goodrich, 3, 355). In the America they described there was no particular disposition to question the propriety of public enterprise, where private efforts proved inadequate to meet public needs. There was little positive preference, on the other hand, for public works as something inherently superior to private endeavors. States or localities undertook roles for which no other agency was fitted, and then waited for the time when the public might "conveniently exchange its position as proprietor for that of regulator" (Heath, 2, 43). Milton Heath's observations on the normal cycle of municipal investment revealed a chronology and a purpose that were repeated at each level of government operation:

> . . . the public function was viewed as an initial, developmental one. After enterprises became established on a profitable basis, city governments tended to transfer their investments to new projects, and so, normally, a transition from public or quasi-public to private ownership and operation took place (Heath, 1, 49).

Local and state governements assumed the "role of the primary entrepreneurs" as part of their normal functions (Heath, 1, 51). When public-spirited citizens met to discuss the need for projects of public utility, they turned naturally toward some variety of the public corporation as the agency best fitted for large efforts (Goodrich, 1, 307). The need for capital was the factor that most frequently determined government entry into the field of enterprise; only public authorities could command sufficient credit at a reasonable interest rate for works of the size demanded. Subordinate considerations were usually present, of course: glib promoters reached eagerly for public funds; hopeful administrators sought state investments so profitable that taxes could be reduced; and in a day when works of public utility were by definition regarded as monopolistic, a people suspicious of power generally were sure to insist that their governments guide these developments with a firm regulatory hand. But underlying every justification for state endeavor was the hope that by public effort businessmen of a locality would prosper, that land values would rise, and that the competitive position of the area would be improved. The whole business community was dependent on state execution of the general investment functions necessary to economic growth; it was by state endeavor that "idle resources could be brought into employment and the social income maximized" (Heath, 1, 47–48).

Discharge of these practical functions required state governments more active, if anything, than those that might have undertaken the theoretical responsibilities discussed by Hartz and the Handlins. The Goodrich and Heath hypothesis, moreover, enjoys the advantage of superior documentation by measurable facts — and contains, at the same time, a plausible explanation for most of the impulses described by the earlier reporters. Above all, the Goodrich-Heath theme is consistent with subsequent developments in the nation's economic history. After the states handed over their projects to private direction, the Federal government emerged as the chief sponsor of transcontinental enterprise, and local governments pledged their credit to the completion of the interlacing railroad net. The terms for these later grants of aid were substantially altered by the maturity and strength of the post-Civil War private corporation, but the established role of government was if anything enlarged.

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However varied the explanations for public sponsorship of enterprise, the facts supporting these stories can be summarized in one generalization: the movement was virtually unlimited both as to time and place. From Missouri to Maine, from the beginning to the end of the nineteenth century, governments were deeply involved in lending, borrowing, building, and regulating. Beyond this observation summary is difficult. Accurate measure of the public's stake in enterprise, for instance, cannot be taken from the evidence here reviewed. The statistics employed by the several authors are of an illustrative rather than a conclusive sort. Diligent in their analysis of the total figures involved in public investment, they have not undertaken similar analysis of the private contribution to mixed corporations. They show a tendency to rely on reported book values in their estimates of total construction costs, and they thus ignore both the enormous discounts involved in marketing stock to private groups, and the extensive practice by which "investors" offered overvalued construction services rather than cash for their share of developments.

Milton Heath's estimate of the cost of the Southern railroad net represents an unusual effort to take these latter factors into account. According to the Census of 1860, the cost of the South's 9,211-mile system had been $245,-212,229. Of this approximate cost, the public had supplied 55 per cent through its official agencies. Further refinement of this estimate, however, suggests that private investment was so often in labor and kind that public authorities actually supplied about three-fourths of the cash required (Heath, 2, 253). In contrast, Harry Pierce emphasizes the importance of state and local investment of $47,150,035.46 in New York's railroads, but he sets total construction costs at $400,000,000, a figure left uncriticized either as to type or time of investment (Pierce, 25, 5).

The bulk of references to the extent of public endeavors, however, are presented without the foregoing bases of comparison. A review of the statistics of state and local investment suggests how generally the movement was shared, and how great a burden governments undertook, but it affords no decisive measure of the government role in contrast to that of private investors. Even with their use thus qualified, the figures are impressive. Pennsylvania was probably the most active, not so much for her investment of $6,171,416 in 150-odd mixed corporations, but for her expenditure of $101,611,234 on the construction and operation of the Main Line canal and railroad system. New Jersey, on the other hand, was one of the few states that stayed almost completely out of the movement (Goodrich, 3, 357; Cadman, *passim.*). In New England, Massachusetts, the only notable state investor, put $8,200,000 in eight railroads by 1860; and she had just begun the celebrated Hoosac Tunnel Project, in which she was to invest $28,856,396 by the turn of the century (Kirkland, I, 324, 432). To the West, Missouri had pledged $23,101,000 to improvements by 1860, a sum estimated by James Neal Primm at 25 times the state's average annual income (Primm, 105). These undertakings of the late forties and the fifties have hitherto been obscured by the familiar story of panic and retrenchment in states throughout the Union after 1837–1839.

The most impressive revelation in the detailed analysis of the improvement program is the degree to which local governments maintained and extended the responsibilities relinquished by many states on the eve of the Civil War. The local aid movement, authorized by 2,200 laws in 36 states, appears to have dwarfed better-known state endeavors (Goodrich, 4, 412–23). The bulk

of local aid, further, was given after the Civil War; enterprise demanded and received vital support from public treasuries so long as there was a mile of American railroad track to be laid. In Maine, for instance, the legislative delegation of Aroostook County was electing public members of the Bangor and Aroostook's Board of Directors in the 1890's, and thus defending the County's new $728,000 stake in the road's future (Kirkland, I, 491).

Harry H. Pierce, in his outstanding study of the railroads of New York, 1826–1875, has taken the only satisfactory measure of the local aid movement. In an account drawn from scattered town records, railroad books and correspondence, legislative records, and court reports, Pierce found that 315 of New York's municipalities pledged $36,841,390.69 toward the construction of the state's roads. The conclusions he drew from study of hundreds of specific projects are arresting:

> . . . the importance of these subsidies lies not in their amount but in their timeliness. In practically every instance the aid was proffered at a critical moment in the company's history. It is significant that, with the exception of the city of Albany, neither the state nor any municipality ever assisted a railroad that was already in operation. Public money in New York always pioneered the way. It took the initial risk. . . . Government aid to railroads not only facilitated the raising of money, but also greatly reduced the cost of financing them. In many cases, particularly in the building of marginal lines, public subsidies made possible the construction of roads that would not otherwise have been built. In an even greater number of instances, it permitted the completion of projects at a much earlier date than would have been possible with private capital alone (Pierce, 25).

Other students agree that local aids were very considerable, but some assert that they were given when public subsidies were of diminishing importance (Goodrich, 4, 435). E. C. Kirkland, for instance, reveals in a few pages the mixed views with which the postwar grants have been described. He concludes that New England communities were "so extravagant and so generous that the pre-war years in comparison were but a diminutive forerunner." By reference to the total capitalization of the roads, however, he minimizes the effect of the new public investments. Although Connecticut towns subscribed 60 per cent of the new railroad securities issued in the state between 1868 and 1877, the town percentage of total capitalization in 1877 "was only nine." In his general summary of New England efforts, on the other hand, he appears to credit the aids with more decisive effect; no other policy, he reports, "public or private, produced so many useless railroads" (Kirkland, II, 309–16).

Local efforts were extensive throughout the Union. Louis Hartz concluded that in Pennsylvania, state investment was at its height "of minor significance compared with investments by cities and counties" (Hartz, 2, 86). Antebellum southern cities and counties contributed $45,625,512.05 out of total southern aids of $144,148,684.92 (Heath, 1, 41). James Neal Primm concluded that most of the stock "sold" in the 1850's by the state-aided railroads of Missouri was sold to the municipalities and counties through which the roads would pass (Primm, 106). The major undertakings of Baltimore are well-known; the city invested about $20 million in railroad development between 1827 and 1886 (Goodrich & Segal, 5, 2). The indications are that cities and counties to the west were increasingly lavish in their grants as the years passed. Cincinnati exceeded Baltimore in expenditures on her municipally owned road; the city of Milwaukee, with a population of 45,246 in 1860, lent $1,614,000 in 1858. Earl Beard's recent analysis of local aid in Iowa reports as an "educated guess" a total of $50 million spent there by the 1890's (Beard,

32). More than adequate figures are at hand, it seems, to support the recent conclusion by Carter Goodrich that the generally employed estimates on the extent of public aid published in 1938 by the Federal Coordinator of Transportation are far too low [8] (Goodrich, 4, 430).

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Detailed analysis of railroad development has not been duplicated in studies of state promotion in other fields. In the four states for which general policy has been described — Massachusetts, Pennsylvania, Georgia, and Missouri — the passage rather than the administration of promotional laws has been offered as evidence of state achievement. Grant of the privilege of incorporation, with attendant alienation of certain public powers, is perhaps the only other major concern subjected to careful definition. There were laws on every conceivable subject, but without an account of enforcement machinery there is no means by which their effect can be judged.

Massachusetts, for instance, used licensing laws to grant monopoly privileges to selected entrepreneurs; the pioneer glass manufacturers of the state were promised years of freedom from competition (Handlin, 3, 81–82). Bounties were given quite freely by several states, particularly to agriculture. Maine paid out $150,000 in the year 1839 alone to wheat and corn producers; nine states subsidized silk culture (Taylor, 380); and Massachusetts aided fisheries and naval stores production (Handlin, 3, 83–84). Tax exemptions and relief of workers from poll taxes or from militia and jury duty were other means by which industries in certain states were encouraged. Pennsylvania was active for a number of years after the Revolution in fixing prices for certain goods and services (Hartz, 2, 206). Many states encouraged quality production by inspection laws, affecting in particular goods consigned to interstate commerce. Georgia maintained 30 public warehouses for the grading and marketing of tobacco by 1800 (Heath, 3, 85); and Missouri inspected virtually all tobacco exported after she constructed a $25,000 tobacco warehouse at St. Louis in 1843 (Primm, 118). Stay laws, relief laws, and public loan offices were familiar phenomena after the Panic of 1819.

The authors cited have skirted warily around one type of major undertaking comparable in scope to the internal improvements effort. Enterprise throughout the union depended heavily on the credit provided by the investment of state capital in banking operations. Recent reappraisals of the operations of the Second Bank of the United States, however, have not been followed by more than casual summaries of the way in which states put their resources behind public or mixed banking systems. A series of articles by Bray Hammond has swept away some of the mythology surrounding these state adventures, but effort to give the movement a proper place in the general story of state enterprise has been limited (Hammond, 1, 2, 3). No one, for instance, has developed the challenging conclusion offered by Guy S. Callender more than 50 years ago, to the effect that the southwestern states, in their large-scale grants of credit to commercial agriculture, maintained responsibilities comparable to the canal and railroad building efforts of the middle states (Callender, 161–62). The amount of money invested has usually been estimated, and banking as a political issue described, but the day-to-day operations and achievements of partially or wholly owned state systems remain a field for

research demanding all the support now promised by the Committee on Research in Economic History.

Opinions expressed casually about forces apart from central themes developed in the subject literature seem in some cases more important than specific illustrations of state enterprise. The role of private capital, suggested in scarcely more than parenthetical references, is quite anomalous. The authors take repeated note of the "unwillingness of private investors to risk their money in railroad securities . . ." (Pierce, 4). Initiative in new adventures was left to the state, partly because of the general inadequacy of private investment funds (Heath, 1, 47–48), but just as often because individuals seeking profit are pictured as cautious to the point of timidity. Even where such a financial community as New York made available more than adequate liquid capital, the spirit of caution prevailed. William H. Aspinwall, John V. L. Pruyn, Edwin D. Morgan, Cornelius Vanderbilt, and Russell Sage moved in to form the New York Central after communities had taken the initial risks, and not before (Pierce, 10). Further, the movement of the substantial private capital that was invested before 1860 is ascribed to community spirit rather than to the hope of gain (Heath, 1, 44–46). Merchants of Baltimore, Charleston, or Savannah sponsored connections with the interior as a program of "metropolitan mercantilism" that would benefit them in a general rather than a particular way. Similarly, the farmers of Wisconsin had not turned speculators when, between 1850 and 1857, they gave nearly $5,000,000 in mortgage notes to railroad builders; they were investing in regional prosperity (Taylor, 98).

These opinions are disquieting in view of the current interest in "entrepreneurial" history. The reviewer is certain that the right hand of the Committee on Research in Economic History knows what its left hand is doing, but there is little evidence to prove it. For instance, in the most important recent contribution from the entrepreneurial school, Thomas C. Cochran's *Railroad Leaders, 1845–1890*, the author takes only incidental and inconclusive notice of public aids other than land grants.[4] This isolation of individual endeavors from public efforts seems all the more curious in view of the fact that the Goodrich-Heath hypothesis describes an American System in which state and private initiative are fully compatible. Continued separation of the themes prevents desirable refinement of both. Greater offenders in this regard are the authors reviewed here whose exclusive concern with public aspects of the mixed corporation permits them to avoid analysis of its private parts. The corporate agency for community action was so mixed an instrument that neither description from the point of view of the state nor analysis from the position of the entrepreneur can alone give a proper view of its growth. Public efforts to employ corporations for social ends deserve their overdue notice, but private contributions remain matters of consequence.

As an early American institution, to be sure, the corporation was a public school for enterprise. Its graduates were never very loyal, but they were no less obligated to it for their experience with major engineering projects, their knowledge of managerial problems, and their skill at gathering and handling large capital. Its modern "private" form was a very late achievement:

> The attributes of peculiar economic efficiency, of limited liability, and of perpetual freedom from state interference were . . . not present at the birth of the American business corporation. Divested of these characteristics, the form assumes a new signifi-

cance. At its origin in Massachusetts the corporation was conceived as an agency of the government, endowed with public attributes, exclusive privileges, and political power, and designed to serve a social function for the State. Turnpikes, not trade, banks, not land speculation, were its province because the community, not the enterprising capitalists, marked out its sphere of activity (Handlin, 2, 22).

In Pennsylvania, of 2,333 business corporations chartered by special act, 1790–1860, 64.17 per cent were in the field of transport, 7.2 per cent in banking, 11.14 per cent in insurance, 7.72 per cent for manufacturing, 2.79 per cent for water, 3.21 per cent for gas, and 3.77 per cent in miscellaneous categories — the form, in other words, was predominantly employed for works of public utility (Hartz, 2, 38). Society, in creating agents to perform social services, attempted through the several states to keep a firm hand both on the evolving corporate agents, and on the quality of the services the agents rendered. At the very least cities and states attempted to protect their investments in transportation companies, and at most they attemped to harness and direct growing corporate power. Both the minimum and maximum attempts were on the whole failures. In the end, society sought the measure of its achievement in the intangibles of community growth and prosperity; there were no other measures, for communities lost their money and they lost control of their corporations.

The state struggle to maintain controls, however, left the issue in doubt for a very long time. In the first place the chartering power was maintained until after the Civil War as a means of potential corporate regulation. The Dartmouth College Doctrine did not break legislative power over the state's creations; it only invited more careful charter limitations (Cadman, 426, 429; Hartz, 2, 236–52; Primm, 35–52). Corporate charters included detailed specifications on the size and power of directorates, the liability of stockholders and officers, the nature of capital structures, and on the details of the operations the organizations might attempt. Regulation of corporate services was generally undertaken. Banks were restricted to collection of interest rates specified in charters, and were often required to reserve a certain part of their loans for named classes. Dividends were controlled by law, especially when specie payments had been suspended (Hartz, 2, 258; Primm, 26–28). Public utilities were subjected to rate regulation, to requirements that certain customers get preferential treatment, and to the maintenance of minimum service schedules (Hartz, 2, 258–60). Illustration of the extent of detailed control might be expanded indefinitely for there were almost as many specific regulations as there were charters.

Effective administration of these laws proved possible only when the regulating authority worked toward reasonably defined and sensibly limited ends. Pennsylvania, equipped with the most ambitious regulatory program, failed in almost all her objectives. The reporting system by which the state's auditor-general kept in touch with state investments broke down completely; state officials responsible for public shares in mixed corporations were assigned more duties than they could identify, much less discharge; and legislative investigating committees proved to be clumsy and inadequate instruments of control (Hartz, 2, 96–103, 262–67). In Virginia, on the other hand, an excellent reporting system was maintained. The Virginia Board of Public Works avoided detailed problems in the administration of mixed corporations, and concentrated on the protection of the state's financial interests, and on the provision of expert engineering services to enterprise. Even when the board controlled

a majority interest in a project, it left to private hands the detailed responsibilities of management (Goodrich, 3, 378–83). In Maryland, where the state and the City of Baltimore selected a majority of the B & O directors until 1867, a similarly effective review of financial and engineering detail was maintained. Baltimore treated the road as a public institution as long as the city had a stake in it; the City Council was seeking wage raises for B & O employees as late as 1880 (Goodrich & Segal, 5, 27).

The nature of the alliance between politics and trade cannot be revealed by facts drawn only from the records of public authorities. For one thing, public directors in mixed corporations were often private stockholders in their own right: the Virginia Board, in fact, required such a display of "interest" by its agents after 1847 (Goodrich, 3, 378–9). The distinction between politician and entrepreneur was consistently vague; three mayors of Baltimore, for instance, served as presidents of railroads aided by the city. John W. Garrett, president of the B & O from 1858 to 1884, was not master of his railroad until he was master of the state of Maryland. He continued then to welcome public subscriptions to the road's development, but he preferred control to remain in private hands (Goodrich & Segal, 5, 19–20, 28–32). Harry Pierce's analysis of the battle between capitalists of Albany and Troy, New York, for control of the western trade, reveals the difficulty of judging such public endeavors as Troy's municipally owned road in the narrow context of either "public" or "private" enterprise (Pierce, 60–81).

Analysis of the intimate association of public and private officials has for the most part been avoided by the authors considered; they have tended to concentrate instead on themes demonstrating a sharp division between public and private interests. In particular they have emphasized the persistent anticorporate spirit evident throughout the nation until deep into the nineteenth century. Abundant evidence has been resurrected to demonstrate popular expression of traditional hostility to concentrated power, to the grant of privilege and monopoly, and to the mysterious or dishonest manipulations by which irresponsible corporate managers maintained themselves. Small businessmen and conservative investors feared corporations, and the public often felt misused by them. These sentiments, however, appear not to have controlled state policies; chartering programs were constantly expanded, and the form was made available to every type of business. The most distinct policy change related to the anticorporate spirit was the frequent adoption of general incorporation laws. Studies of the general incorporation movement in Massachusetts, New Jersey, Pennsylvania, and Missouri, however, reveal it to be something other than a Jacksonian extension of privilege to all comers. For enterprisers, general laws in these states were rigid and unwelcome rules written by men who wanted to restrict corporate power and growth. They were not employed by businessmen, who continued to seek and get the special charters given freely until after the Civil War. Even the Democrats, who tended to be authors of the laws, seemed to be satisfying emotional needs rather than executing serious policy; they passed general laws, and then continued in the same sessions to grant special privileges on request (Handlin, 3, 233–5; Cadman, 431–8; Hartz, 2, 38–42; Primm, 54–62).

While communities indulged their anticorporate emotions, they continued to charter, regulate, and subsidize in their search for necessary social services. The retreat from public investment came only after the railroads had been

built, and usually under the pressure of major economic crises. Increasingly, though, the regulatory effort was designed for the protection of public funds, rather than for the direction of corporate behavior. Massachusetts, in fact, demonstrated no other purpose from the start (Kirkland, I, 325). State activity declined sharply in the early 1840's, and then revived for a briefer season in the 1850's. The local aid movement reached its climax after the Civil War, before the substantial reaction of the 1870's (Goodrich, 6, 145–52). The retreat from aid by the cities was accompanied by widespread effort to dishonor municipal bonds; communities were without scruple in their efforts to repudiate debts blamed on dishonest promoters, incapable builders, and venal public officials (Pierce, 84–86; Goodrich, 6, 152–5; Beard, 16).

The retreat was not universal, and the sense of having been cheated was not generally shared. Bangor and Baltimore continued to subsidize, and in the southern states the Civil War only delayed for a season the Reconstruction climax of state aid. The financial record of the southern states had been good, the roads well built, and the hope of public profit reasonable (Heath, 2, 250–2). Communities, moreover, had never staked their hopes on business balance sheets. Only one city in 25 made a profit from railroad investments in New York, but 85 per cent of the cities subsidizing got the improved transport for which they had worked. Public losses were probably no greater than those of early private investors, and the communities had more to show for their effort (Pierce, 127). Massachusetts suffered a $9,500,000 loss on her $28,856,396 Hoosac Tunnel expenditures; profits went to the "tunnel ring" in the northwestern part of the state. But early in the twentieth century 60 per cent of Boston's exports flowed east through the "great bore" of Massachusetts politics, and all New England depended heavily on this gateway to the West (Kirkland, I, 430–2). In Virginia a committee of the Senate, balancing profit and loss on the ante-bellum effort, concluded in 1876 that state investments had been justified by the increased wealth of the whole area served (Goodrich, 3, 387). The state-owned and operated Western and Atlantic Railroad of Georgia was not only the first railroad to penetrate the Appalachian Chain; the road won for the state control of western imports into the eastern cotton belt. Georgia, whose public planners share with the builders of the Erie Canal the greatest reputations in the improvements field, has long been recognized as the executor of a "master-stroke in railway policy."[8]

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Conclusions invited by summary of the 25 books and articles digested in the preceding pages tend to take the form of questions rather than assertions. The significance of the literature reviewed cannot be established until the themes suggested are tested in a more general synthesis than has been attempted by any of the authors referred to here. At present the works present an extended and more exact analysis of the spirit, policies, and achievements of the internal improvements era. This much is clear gain. The considerable influence of the newly reported theory and detail is measured by the prominence accorded government as sponsor of enterprise by George Rogers Taylor in the most recent volume of the Rinehart *Economic History of the United States*. But the most basic reappraisal of the internal improvements movement can scarcely be regarded as "new" in any bold sense; the subject is too much a staple of

American economic history, and has for too long been a principal retreat for Ph.D. students seeking thesis topics. Also, more than 50 years have passed since Guy S. Callender contributed a brilliant explanation for state accumulation of $200,000,000 in capital for investment in ante-bellum industrial development, and if two more generations pass before the current version of the Callender thesis is further refined, then the recent burst of scholarly energy may not seem very significant.

One can hope for alternative developments. Taken together, the works reviewed now end on a tentative note, and leave unresolved some of the more fundamental questions they raise. Studies of the theory and practice of local aid, for instance, reveal no changes in the public mind that justify continued use of the Civil War as a convenient point to close off the story of government activity. The absence of the Federal government from the new literature is inexplicable, particularly during the 1860's and 1870's, when Washington assumed for the states so many of their services to enterprise. A fresh approach to Federal sponsorship of economic growth, undertaken in knowledge of the traditions that descended to national officers from the era of state aid, might give a new look to Radical Republican policy. The decade of monetary reform, tariff revolution, and resource alienation has been so rudely handled in the liberal historical tradition that the postwar era is remembered for corrupt deviations, rather than as a time for logical extension of established public procedures. Yet the story of public risk-taking and private profit-making does not appear to have been altered very much by transfer of the issues to the Federal sphere. The Goodrich-Heath explanations and chronology for government intervention and withdrawal might add as much meaning to Federal policy as they did to the lesser efforts by states and cities. A further test of the thesis certainly seems merited; controversies on the role of government seem almost interchangeable as the decades pass. The same angry words echo out of debates in widely separated eras, whether the subject is the delivery of monopoly powers to the Camden and Amboy, the sale of the Main Line System to the Pennsylvania Railroad, the alienation of the trans-Mississippi West, or, for that matter, the negotiation of the Dixon-Yates Contract. Perhaps historians, in their dismay at certain memories they report, have too long delayed resignation before a persistent theme in the nation's economic development — the incorrigible willingness of American public officials to seek the public good through private negotiations.

The detail of these negotiations should be pursued with infinite care. No one has undertaken extended or precise description of the way public and private obligations were combined by officers and public guardians of ante-bellum mixed corporations. Their compromise of sometimes contradictory duties, nonetheless, established ruling conventions for postwar economic organization. The mixed railroad corporation was not only parent to "big" business in the United States; its leaders also defined the character of business-government relationships, the duties of corporation to public, and the responsibility of manager to investor. Customary procedures and standards of behavior for managers of the modern corporation were thus conceived in ideological twilight, and had become habitual before the individual entrepreneur achieved a firm grip on the corporate form. Perhaps from the divided loyalties of the public-spirited men who planned so boldly for early community growth there emerged the ethical confusion characteristic of subsequent corporate behavior.

Speculation on this point needs support from more abundant and specific fact than is yet available from the era of the mixed corporation.

To studies of the continuing association of government and enterprise should be added the equally unbroken theme of state regulatory efforts. The hiatus between stories of state control policies before and after the war becomes increasingly hard to justify, particularly after recent indictment of the view that "Granger" laws were the product of agrarian discontent.[6] Just as individual enterprisers of the forties and fifties had joined in unsuccessful efforts to reduce corporate power, so, in the sixties and seventies, merchants and shippers maintained and strengthened control mechanisms. The considerable complexity of the postwar laws may possibly reflect long years of uninterrupted experience and concern with protection of the public interest. The only major break in regulatory policy appears to lie in the uneven assumption by the Federal government of earlier state responsibilities. Even at Washington, state patterns were repeated; controls, whatever the level of government, tended to lag about a generation behind aids.

The substantial energies of government, though, were employed more often for help than for hindrance to enterprise. The broad and well-documented theme reviewed here is that of public support for business development. Official vision and public resources have been associated so regularly with private skill and individual desire that the combination may be said to constitute a principal determinant of American economic growth. Internal improvements dominated the association in ante-bellum years, but opportunities for broader use of the alliance multiplied as controls over the economy became more centralized. Resolute Federal decision was in time revealed to be a key to remarkable productive achievement, most notably during the wars of the twentieth century. States and cities meanwhile transformed their record of debt from millions to billions as they constructed the nation's highways and public buildings, and extended their public services; B. U. Ratchford's analysis of American state debts might serve as an outline for a score of theses on the influence of Keynesian experiments, before Keynes. Rising constantly from the impulse to public-spirited undertakings, moreover, was the neomercantilism of regions and provinces of the American economy which came to replace the earlier and simpler competition of cities and states. Commercial clubs in the cities, industrial commissions in the states, and governors' conferences in the regions all joined in sponsorship of industrial expansion.[7] The story sprawls out to ungovernable proportions, to tax exemptions, police-guaranteed labor discipline, municipal power-plant construction, and on to RFC, TVA, and AEC. Even communities in Mississippi, the very oldest and deepest of the southern states, have in the past 14 years spent $29,206,000 in the construction of free factories for 92 enterprises who have agreed to locate there. From the grass roots putting up shoots before Chamber of Commerce buildings to the Office of the President's Council of Economic Advisors there can be documented the unceasing pressure for public sponsorship of economic growth.

Milton Heath, in the earliest contribution to the literature here considered, described the public aid movement of ante-bellum years as possibly the "last great associative effort on American soil" (Heath, 2, 60). In this judgment he was probably as wrong as other authors who have analyzed the internal improvements effort as something unique in the American experience. The distant historical phenomenon they report proves very close at hand. Instead of the

last great associative effort, they have revealed theory and practice for the first of continuing efforts to associate the massive powers of government with the skill of enterprise. Historians have been unaccountably slow in seeking the general themes of this story; they catalogue the plans of a Hamilton, a Gallatin, or a Clay, but they have ignored the rapid translation of these schemes into essential elements of a lasting American System. The notable accomplishment of the authors reviewed lies in the bold step they have taken down the road that leads from Hamiltonian dreams toward the mixed economy of contemporary America. This road is not yet fully marked, but its general direction is now clear. Further studies of government's partnership with enterprise may reveal it to be one of the major routes connecting early American hopes with recent material achievements.

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[1] The following list of books and articles reviewed is arranged to serve as an index to specific data employed in the text. Review-style citation is utilized, where reference is to material in the subject literature. The several contributions of a single author are numbered to simplify identification of the work cited. E. C. Kirkland's study of New England railroads, G. R. Taylor's general history of the ante-bellum period, and G. S. Callender's seminal article are grouped with the works below so that they can be cited conveniently, but no effort is made to summarize their generally known contributions.

Earl S. Beard, "Local Aid to Railroads in Iowa," *Iowa Journal of History*, L (1952), 1–34.

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Guy S. Callender, "The Early Transportation and Banking Enterprises of the States in Relation to the Growth of Corporations," *Quarterly Journal of Economics*, XVII (1902–1903), 111–62.

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2. "National Planning of Internal Improvements," *Political Science Quarterly*, LXIII (1948), 16–44.
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3. "Free Banks and Corporations: The New York Free Banking Act of 1838," *Journal of Political Economy*, XLIV (1936), 184–209.

Oscar Handlin

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2. with Mary Flug Handlin, "Origins of the American Business Corporation," *Journal of Economic History*, V (1945), 1–23.
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Louis Hartz

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1. "Public Railroad Construction and the Development of Private Enterprise in the South before 1861," *Journal of Economic History*, X, *Supplement* (1950), 40–53.
2. "Public Co-operation in Railroad Construction in the Southern United States to 1861" (Unpublished Ph.D. dissertation, Harvard University, 1937).
3. "Laissez Faire in Georgia, 1732–1860," *Journal of Economic History*, III, *Supplement* (1943), 78–100.

Frederick K. Henrich, "The Development of American Laissez Faire. A General View of the Age of Washington," *Journal of Economic History*, III, *Supplement* (1943), 51–54.

Edward Chase Kirkland, *Men, Cities, and Transportation. A Study in New England History 1820–1900* (Cambridge, 1948).

Harry H. Pierce, *Railroads of New York. A Study of Government Aid, 1826–1875* (Cambridge, 1953).

James Neal Primm, *Economic Policy in the Development of a Western State. Missouri, 1820–1860* (Cambridge, 1954).

George Rogers Taylor, *The Transportation Revolution 1815–1860*, Vol. 4, *The Economic History of the United States* (New York, 1951).

[2] Arthur H. Cole, "Committee on Research in Economic History. A Description of Its Purposes, Activities, and Organization," *Journal of Economic History*, XIII (1953), 79–87.

[3] Federal Coordinator of Transportation, *Public Aids to Transportation*, I (Washington, 1938), 18–19.

[4] Thomas C. Cochran, *Railroad Leaders 1845–1890. The Business Mind in Action* (Cambridge, 1953), pp. 17–18, 96–98, 184, 189–94, 200–1.

[5] Ulrich Bonnell Phillips, *A History of Transportation in the East Cotton Belt to 1860* (New York, 1913), p. 334.

[6] George H. Miller, "Origins of the Iowa Granger Law," *Mississippi Valley Historical Review*, XL (1954), 657–80.

[7] Robert A. Lively, "The South and Freight Rates: Political Settlement of an Economic Argument," *Journal of Southern History*, XIV (1948), 357–84.

BOOK REVIEWS

Three Stars for the Colonel. By James A. Clark. New York, Random House, Inc., 1954. Pp. xv + 221. $4.00.

On 3 October 1930, "Dad" Joiner, a little man in white shirt sleeves, a pork-pie hat and baggy trousers, started events to unfolding in East Texas which presently catapulted Ernest O. Thompson into America's industrial limelight. On this date, Joiner watched his No. 3 Daisy Bradford oil well blow in, in an area hitherto considered as of little importance for oil production. The significance of Joiner's discovery well was soon apparent, however, when farther north the Bateman and Lu Della Crim wells, and then hundreds of others, proved that he had discovered the nation's largest oil field.

Since Spindletop in 1901, oil discovery and production had out-distanced demand and had demoralized the market price for crude oil, even though the rapidly increasing manufacture of automobiles had introduced oildom's "Gasoline Era." One major oil field after another had been developed in Texas — Sour Lake, Batson, Humble, Electra, Big Lake, the huge Panhandle area, Mexia, Powell, Ranger, and Breckenridge, to name only a few oil fields which had popped out on the Texas landscape like overnight mushrooms. The rapid development of each field discovered had been accompanied by wild and reckless boom-town building, ephemeral company organization, financing, drilling, and waste. Gushers were allowed to gush to stimulate mad speculation, and night-and-day oil-field flares were perennial reminders of the dissipation of oil-well energy and of flagrant waste, whether wells had been drilled by inexperienced wildcatters or by "conservative" major company experts. Each new oil field passed through the same gamut — excitement, confusion, uncontrolled speculation, heedless drilling, and overproduction and outlawry — all the birth pains of our modern oil industry. The East Texas "Black Giant" made other Texas oil fields seem small. Within two years after its discovery, it embraced a vast forest of derricks reaching from 20 miles south of Joinerville to more than 30 miles north of Gladewater. By 1 June 1931, more than 1,000 wells were pouring a flood of oil into newly-built wooden tanks and earthen reservoirs, and even into creeks, gulleys and draws, without any effective legal restraint.

Meanwhile the market price of crude oil had almost hit the bottom. Governor Ross Sterling, realizing that an emergency measure was necessary, called out the Texas National Guard to aid the state's Railroad Commission in bringing order out of confusion, but without too much success. Then, writes James A. Clark in his *Three Stars for the Colonel*, a man of extraordinary ability and personality was put on the Railroad Commission to save a desperate situation. And save it he did, although he was handicapped by numerous adverse Federal court decisions, by the operations of heedless drillers and producers, and by "hot-oil runners," but in the end he succeeded. His firmness, fearlessness, fairness, and keen insight into oil-field maintenance and conservation, as well as market stabilization, were presently acknowledged by both Federal and state law.

Mr. Clark writes how Thompson became an increasingly important figure in solving the intricate state and interstate oil production problems, oil-field maintenance, well spacing, and general oil and gas conservation. President Franklin

D. Roosevelt recognized him as America's best-qualified man for this role when he called on him to stage a White House conference to be attended by the governors of oil-producing states, relative to the advisability of interstate action on conservation and production. Roosevelt also sent him to Europe as our nation's representative to a world's conference on petroleum.

Not the least of the interesting phases of this book is that devoted to Thompson's life and training from the time when, as a boy, he sold newspapers on the streets of Amarillo, to when, in recent years, he gained the rank of a three-star general. In this phase of the story the reader may see how modesty, progressive idealism, and hard work had their fitting rewards. In all his professional activities, his wife and ardent friends played important roles.

Only a few minor faults are found in this book. The author has thrown in occasional and unnecessary dialogues and fill-ins to enhance the book's interest. And as to omissions, two or three maps, well-chosen illustrations, and a good bibliography would have added to its general usefulness. The publisher has also used a less attractive book format than the subject deserves.

CARL COKE RISTER

Texas Technological College

* * *

History of American Industrial Science. By Courtney Robert Hall. New York, Library Publishers, 1954. Pp. 453. $4.95.

The American industrial and technical system has produced a quantity of goods and services greater than that of any other nation during the last half century. Professor Hall, writing for a general rather than a scholarly audience, has told in a lucid, but sometimes repetitious, manner the story of American industrial progress. After a brief sketch of the nation's economic growth from the seventeenth through the nineteenth century, the author turns his attention to the enormous technological expansion of the twentieth century. This he describes by presenting a plethora of detail about the transportation, chemical, electrical, mining, rubber, food, clothing, and precision instrument industries. He concludes with a survey of how America mobilized economically to meet the demands of two World Wars.

We are left to assume, however, that industry, like Topsy, "just growed," for the author offers no explanation for its economic development. Furthermore, there is much more that he fails to discuss. Any history of industry after 1900 should include mention of Frederick W. Taylor and the cult of scientific management. Likewise, recognition must be made of the stream of trained personnel — scientists, engineers, and technicians, who vitalize industry today. While the author refers to the huge research programs now undertaken by industry, he refrains from mentioning that such outlays of money were possible only after individual corporations reached a state of oligopoly.

The most irritating quality of the book is a constant Horatio Alger touch which seems to have beguiled the author. The story of each industry appears so completely a success that the reader is never aware that failures did occur and that certain industries sometimes stagnated. It is a well-known fact that the United States Steel Corporation lagged badly during the 1920's and 1930's in the production of new products. The explanation of the author's cautious

attitude can be found in the bibliographical note where he gives credit to some 60 corporations for use of their company histories and annual reports. Such materials are generally too laudatory to be of much use beyond explaining general production policies. In spite of these defects, Professor Hall has provided an informative survey of the many benefits American industry has brought the country and the world.

JAMES G. KELSO

Massachusetts Institute of Technology

* * *

The History of Kirkstall Forge. By Rodney Butler. York, England, William Sessions, Ltd., The Ebor Press, 1954. Pp. 265.

Here is a new, enlarged and handsome edition of a book which, even in its title, forcefully recalls that ours is still the "New World." At Saugus, Massachusetts, a seventeenth-century ironworks that operated for only about 25 years, and intermittently at that, has just been restored by the American iron and steel industry as a monument to its founders. New Englanders have boasted of the Leonard Forge at Raynham, Massachusetts, which turned out iron, by one process or another, from about 1655 to 1876. Canadians have called the Saint Maurice Forges near Three Rivers (1729–1883) the cradle of heavy industry on this continent. All these are cut down to modest proportions by the history of a still vigorous steel forging and fabricating enterprise which can record, *inter alia,* "On May 20th, 1920, iron ceased to be worked at Kirkstall Forge, after an unbroken run of more than 700 years."

American sponsors of company histories, and their authors, could well turn to Rodney Butler's history of his ancient family firm for lessons in modesty and integrity. This is above all the story of the Butlers, a quite remarkable clan. Extensive research has produced little on iron-making by the monks of Kirkstall Abbey, their tenants and successive owners down to 1630. Thence to 1779 the story is fuller, thanks to the Spencer papers at Bradford and Dr. Arthur Raistrick's fine studies of the Yorkshire iron trade. From the time a powerful woman, Betty Beecroft, persuaded a less than eager husband to take up, with the help of their Butler in-laws, the lease of the Forge, its farm lands and mill, however, Beecrofts and Butlers people one fascinating page after another. Their sharing of responsibilities, their business accomplishments and failures, their reactions to the ongoing sweep of events which in retrospect is history, all — or almost all — are recorded with good taste, and with a minimum of fanfare and apologia, in a rich and richly human account of a business and a family.

There are omissions, of course. The last 40 years are skimped on the grounds that rows of figures are dull and much that has happened since 1914 is "too recent." Since the firm's growth in this period was most impressive, and since we are told that it was wholly financed out of the company's savings, the business historian would give much for a look at production and profit figures. One would also like to know more of the Butlers' reactions and responses to the problems of wars and depression, cartels and foreign competition, and above all of nationalization. Perhaps another Butler, writing 50 years hence, may see fit to help to satisfy a curiosity which the present author and his subject, especially in its contemporary phase, keenly whet.

For the nineteenth century there is a wealth of material. The historian of technology can turn to changes in physical plant as shown in photographs of well-done models; to continuities and discontinuities like the overlapping use of water power, steam and electricity; to the development and manufacture of cranes and pumps, hammers and presses by a firm that joined "Engineers" to its title of "Ironmasters." For the social historian there are data on wages, on relations between company and workers, on the Wesleyan version of the Protestant ethic influencing Beecrofts and early Butlers, on the Victorian business family. The "general reader" will find a full store of human interest materials that can only have been scratched in the script of a B.B.C. play on Kirkstall Forge aired in the summer of 1952.

The Butlers have a sense of history, and a love of history, as well they might. It was only in 1893, after paying rent to the Cardigan Estate through four generations and 115 years, that they bought the Forge. In 1818 they took on a solicitor; they have been served ever since by the firm that gentleman founded. There are families of employees that have worked for them since the end of the eighteenth century. The lasting power of certain pieces of plant equipment would tax the credulity of Americans.

And yet there has been no resisting of change. The coming of the railroad made the Butlers designers and engineers. The coming of the automobile saw them shift from the manufacture of cart axles to those for trucks and lorries. When metals processing became a science they set up research and testing laboratory facilities. World War I had them taking on women assemblers, although not alongside of men. World War II found them building new facilities on government order and "adapting" to air raids and threatened invasion. In 1949, aware of what heavy inheritance taxes on the estate of a major shareholder might do to the firm, they incorporated as a public company, Kirkstall Forge Engineering Ltd., with a share capital of £1,250,000. In 1952 they set up a branch plant in Australia. They are far from finished, short of atomic desolation or similar mass overturning of the Butlers' world.

Concluding his story of Kirkstall Forge, Rodney Butler writes, "All through its history there have been no giants, or men of outstanding ability, but all the time there have been men who were prepared to work hard with active brains, much common sense and the courage to take calculated risks." The judgment is probably as sound as it is modest. The man who makes it has a sense of perspective. In his book there is unevenness that somehow calls to mind the reminiscences of an old man, if those of any man could spread over seven centuries. It is nevertheless one of the better among those company and local histories to which scholars will turn as they set out to write the "Big History" of modern industrial society.

E. N. Hartley

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* * *

Business Without Boundary: The Story of General Mills. By James Gray. Minneapolis, University of Minnesota Press, 1954. Pp. xiii + 343. $4.75.

Some years ago this reviewer saw the reaction of German women to *Betty Crocker's Picture Cook Book.* There was nothing like it in Germany, nor probably in all Europe. In Germany where memorized recipes passed from mother

to daughter, along with other folklore, the years of food shortages had kept German girls from cooking experiences more complex than boiling potatoes. To German women Betty Crocker's cook book, with its practical hints and profusion of recipes, seemed like a gate to paradise. Voted second only to Mrs. Eleanor Roosevelt, Betty Crocker's popularity was soundly based by her creator and employer, General Mills, upon service to the American housewife in the preparation of food. This attitude reflected the beliefs and industrial statesmanship of James Ford Bell, the father of General Mills.

The predecessor of General Mills was the Washburn Crosby Company. In 1866 Cadwallader Washburn selected the St. Anthony Falls water power site in Minneapolis for a large mill whose flour-grinding capacity ran far beyond the existing markets. Washburn had difficult problems of management, milling technology, and transportation to solve. In 1869, George H. Christian, a self-taught genius, was retained as manager. Much of the success in the milling revolution in hard spring wheat belongs to this man, although the work of many men was involved. Perhaps most important of the technical improvements was the development of the middlings purifier. The transportation problem was solved by the spread in the railroad network between 1870 and 1890.

The Crosby part of the company was added in the late seventies in the form of John H. Crosby, who became manager of the mills about the same time that William H. Dunwoody, who later developed a large market in Great Britain, joined the organization. In 1888, James Stroud Bell, a Philadelphia Quaker and flour-buyer, was enlisted as a managing partner. Two years later Bell and Dunwoody leased the mills from the Washburn heirs, and by the turn of the century the Bell group had bought control of the mills.

The senior Bell believed in advertising, and in the Gay Nineties the company's slogan, "Eventually — Why Not Now?," became embedded in the folk speech of America. During the same decade southern markets were invaded, and shortly after the close of the century a mill was built at Buffalo. This shift in wheat milling from the Midwest to the eastern end of the Great Lakes was prompted by a change in railroad freight rates that made it cheaper to ship wheat than flour from the Midwest via the Great Lakes to the eastern markets. Milling costs were no higher at Buffalo than at Minneapolis, and flour milled at Buffalo could be sent to eastern and overseas markets without excessive transportation costs. Abundant supplies of American wheat could reach Buffalo by a water route. Moreover, under the Dingley Tariff of 1893 Buffalo could tap the flow of Canadian wheat, mill it in bond, export the flour from the ice-free port of New York, and retain the by-products.

In 1928 James Ford Bell, who had attained national prominence as head of the Milling Division in Hoover's World War I Food Administration, consolidated western and southwestern mills with Washburn Crosby in a new milling empire, General Mills, Inc. Although the mood of the times was for consolidation, there were additional good reasons that led to the formation of the new organization. The per capita consumption of flour had declined, milling capacity was overextended, and a larger unit was needed to meet the increased bargaining power of the great chain retailers and of the large commercial bakeries. Besides, Washburn Crosby mills were in an area that produced only a quarter of the available wheat.

The past three decades have witnessed a number of important developments

in this flour-milling empire. The 1920's saw the milling of durum wheat for macaroni, daily baking tests, a Products Control department to maintain quality, the purchase of a radio station for advertising, the first "singing commercial," the birth of Wheaties, and the appearance of Betty Crocker. The next decade brought Bisquick and Cheerios, research into vitamins in partnership with the Eastman Kodak Company, and the development of enriched flour. Recent research has included work with balloons in the realm of the cosmic ray.

Writing a good company history is a formidable task. The historian must inform himself about general economic conditions during the life of the company, the history of the industry over the same period, regional peculiarities, and technological developments. Records may be scanty or measured by the ton. The company's history must not be confused with advertising, and the historian must be neither publicity agent nor muckraker. He must have a feeling for his subject, present it in vivid and illuminating language, but eye it like a stern father. Measured against these standards the author has accomplished his task with skill and grace. The professional historian, however, will regret the lack of documentation.

RODNEY C. LOEHR

University of Minnesota

• • •

Trees to News. By Carl Wiegman. Toronto, McClelland & Stewart, 1953. Pp. 364. $4.50.

This well-written book describes a business activity which has not been treated very adequately in the past. The author depicts very well the efforts of the Tribune to assure itself of a supply of its important raw material, newsprint. The account of this struggle is interesting and the flavor and force of the personalities involved come through to the reader.

The format of the book is pleasing and the typography adequate with a minimum of misprints. The endpaper maps add greatly to the reader's understanding of the location of plants and of power and woods operations. The photographs are well selected and serve to point up the text. However, it is to be hoped that the Ontario Paper Company, Limited, has replaced the very primitive fire lookout tower which is illustrated opposite page 35.

There is a great deal of information on production, cost of production and building of plants scattered through this book. The diffusion of this information makes it almost impossible to get an over-all conception of either the complete enterprise or its important activities. What were the profits and what was the amount plowed back into the business and how much was paid out in dividends? What was the capitalization of the various companies and how was it increased? How did the number of employees grow? These are a few of the questions which occur to me. This book would have made a more valuable contribution to the history of business if the appendix had been expanded to include a chronology which would show the formation and inter-relationship of the various companies along with their original capitalization. Tables showing increases in capitalization, earnings, profits and dividends, payrolls and numbers of employees during the years would give the reader a better grasp on the organization and operations of the companies described in the text.

Perhaps I am being academic, but I like a bibliography and footnotes to be

included in a book of this kind. Very often I learn of new sources of information from these portions of a book and it does give the reader some indication of the type of material drawn on and the exhaustiveness of treatment. Even if most of the material was derived from company records, I would like to know which ones were consulted.

There is one point in this book which I question. Someone has said that, "The successful executive is the man who can be right fifty-one per cent of the time." The gilt lies a bit heavy on Col. McCormick; I suspect that he did make mistakes, serious mistakes which should have been included.

It is a pity that this good book could not have been a better book by the inclusion of more statistical and financial information. The collaboration of a business historian would have achieved better balance. The sad part of it is that it will be a long time before another book will be written on this subject.

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